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VIEWS, NEWS AND INTERVIEWS.

Dr. Jameson, of Transvaal fame, has taken charge of the construction of the transcontinental telegraph line across Africa from North to South. For the present it will not extend beyond Lake Tanganyika.

The telephone line between Budapest and Berlin was formally opened on August 31.

President Uhlman, of the Brooklyn, N. Y., Elevated Railroad, last week authorized a statement that all negotiations looking to a consolidation of his road with the Brooklyn surface roads are off.

The number of fatalities that occur through persons being swept over Niagara Falls has aroused public interest to such an extent that means are being devised to lessen the danger of drowning accidents. John S. Macklen has addressed a letter to Governor Black, in which he advocates stretching a light wire cable across the river just above the danger line, which is below the line of navigation. He would run a light metal or rubber tube with bulbs at intervals along the cable. He also advocates the use of incandescent lights along the cable, so that it could be seen at night. A letter from William N. Griffith, the governor's private secretary, approves the plan, and expresses the opinion that steps should be taken in the matter jointly by the State of New York and the Dominion Government. The cost would be less than $10,000.

Pres. H. H. Vreeland, of the Metropolitan Street Railway Company, of New York city, said last week that there were now 6,000 men at work on the Fourth and Madison avenue line, and that by next month electric cars would be in operation from Astor place to the Grand Central station. He said that this expedition was due to the new method of putting in the tracks employed by the company in order not to add to the present torn-up condition of the streets for any longer time than necessary. Instead of laying temporary tracks alongside the old horse railroad tracks, the work has been much hastened by simply closing the tracks entirely while the work of construction is going on. When the work is finished the company will have expended from $10,000,000 to $15,000,000 in improving the transit facilities of the city, and at least $1,000,000 in practically repaving 50 miles of streets.

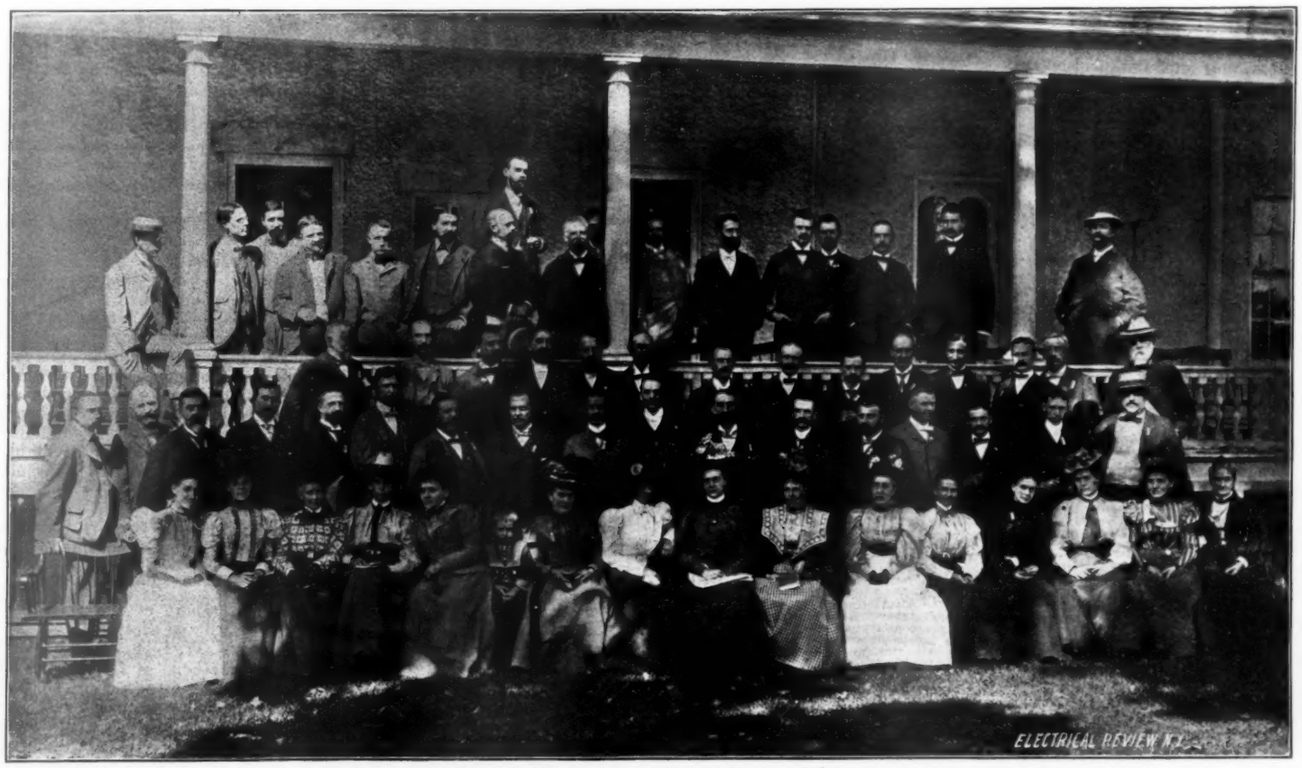
New Orleans, La., has lately been annoyed by a plague of electric light bugs.

EDISON ILLUMINATING COMPANIES.

The Association of Edison Companies Holds a Brilliant Convention at Niagara Falls.

ONE OF THE MOST LARGELY ATTENDED AND INSTRUCTIVE MEETINGS IN THE HISTORY OF THE ASSOCIATION—THREE DAYS OF IMPORTANT PAPERS AND ANIMATED DISCUSSION — PRESIDENT INSULL'S ADDRESS.

The Association of Edison Illuminating Companies closed a three days' session at Niagara Falls on Thursday of last week, and is to be congratulated on the attendance, interest and evident earnestness at each meeting. President S. Insull, of Chicago, called the meeting to order at 10 A. M., Tuesday, in a convenient parlor of the Cataract House, with Secretary W. S. Barstow, of Brooklyn, as his



Group of Delegates Attending the Convention of the Association of Edison Illuminating Companies, Cataract House, Niagara Falls, N. Y., September 14-16, 1897.

valued assistant. There were present about 75 members, and when the large values represented by each are considered, this number represents an immense and influential interest that the mere figure does not imply. Among the attendants at this, the eighteenth convention, were the following:

Geo. A. Redman, Rochester Gas and Electric Co., Rochester, N. Y.

A. M. Robertson, secretary and general manager Minneapolis General Electric Co., Minneapolis, Minn.

J. S. Crider, Edison Electric Illuminating Co., Cumberland, Md.

A. W. Field, secretary and manager The Columbus Edison Electric Light Co., Columbus, Ohio.

Geo. H. Finn, secretary, treasurer and general manager Edison Electric Light and Power Co. of St. Paul.

Wm. G. Beale, counsel of Chicago Edison Co., Chicago, Ill.

Warren H. Girvin, general manager Edison Light and Power Co., Syracuse.

Geo. W. Davenport, treasurer Electric Light and Power Co., Syracuse.

W. M. Anthony, comptroller Chicago Edison Co., Chicago, Ill.

Alex. Dow, general manager Edison Illuminating Co. of Detroit, Mich.

J. W. Lieb, Jr., general manager The Edison Electric Illuminating Co. of New York.

C. L. Edgar, vice-president and general manager Edison Electric Illuminating Co. of Boston.

Hoyt Post, director Edison Illuminating Co., Detroit, Mich., also director Edison Light Co., Grand Rapids.

Leon H. Scherck, connected with Edison Electric Co. of New Orleans, La.

Charles R. Price, treasurer New Bedford Gas and Edison Light Co., New Bedford, Mass.

John W. Howell, Edison Lamp Works, Harrison, N. J.

R. R. Bowker, first vice-president Edison Electric Illuminating Co. of New York.

J. S. Colby, treasurer and general manager Des Moines Edison Light Co., Des Moines, Iowa.

M. A. Beal, secretary and treasurer Forest City Electric Light and Power Co., Rockford, Ill.

W. S. Smith, superintendent Toledo Consolidated Electric Co., Toledo, Ohio.

W. H. Johnson, secretary and manager The Edison Co., Philadelphia, Pa.

Charles G. King, Chicago Edison Co., Chicago, Ill.

Wm. Chandler, Edison Sault Electric Co., Sault Ste. Marie, Mich.

Samuel Insull, president Chicago Edison Co., Chicago, Ill.

W. S. Barstow, general superintendent Edison Electric Illuminating Co., Brooklyn, N. Y.

Chas. E. Pattison, Edison Electric Illuminating Co. of Boston, Mass.

L. A. Ferguson, Chicago Edison Co., Chicago, Ill.

Geo. P. Hagner, treasurer Newport Illuminating Co., Newport, R. I.

Luther Stieringer (of New York), Edison Electric Co., New Orleans, La.

T. C. Martin, editor the *Electrical Engineer*, New York.

John B. O'Hara, *Western Electrician*, Chicago, Ill.

John Kruesi, General Electric Co., Schenectady, N. Y.

John McGhie, General Electric Co., New York.

S. D. Greene, General Electric Co., Schenectady, N. Y.

John Jay Abbott, Chicago Edison Co., Chicago, Ill.

W. H. Francis, Edison Electric Illuminating Co. of Boston, Mass.

C. C. Perry, Indianapolis Electric Light and Power Co., Indianapolis, Ind.

Geo. R. Stetson, president New Bedford Gas and Edison Light Co., New Bedford, Mass.

Chr. Wustenfeld, manager Elgin City, C. & A. Ry. Co., Elgin, Ill.

A. S. Knight, Edison Electric Illuminating Co., Boston, Mass.

James S Humbird, Edison Electric Illuminating Co., Cumberland, Md.

Aug. Leonard Smith, president Appleton Electric Light and Power Co., Appleton, Wis.

Martin J. Insull, of Sargent & Lundy, Chicago, Ill.

R. S. Hale, Boston, Mass.

Chas. Batcheler, of New York.

Chas. D. Shain, of New York.

H. T. Edgar, of New York.

Geo. T. Manson, New York, the Okonite Co.

W. M. Habirshaw, of New York, India Rubber and Gutta Percha Co.

Wallace S. Clark, Schenectady, N. Y.

Chas. W. Price, ELECTRICAL REVIEW, New York.

H. L. Shippy, New York, J. A. Roebling's Sons Co.

Geo. J. Jackson, New York, National Conduit and Cable Co.

The address by President Insull was frequently applauded, and is in full as follows:

ADDRESS DELIVERED BY MR. SAMUEL INSULL.

The decision of the members of the association at the last annual meeting to hold its eighteenth convention at Niagara Falls, was naturally dictated by the world-wide interest in the work of generating and distributing electrical energy, using the famous Niagara River as a prime motor. In assembling at a spot where so much can be learned by those engaged in electrical business, we are, as an association, paying the highest tribute that we can to the wonderful work of those who have had the courage as capitalists and engineers to design and build a plant which has given a great impetus to the economical production of electric current, not only by means of water as the prime motor, but by all other methods for the production of electrical energy. We can not all have the advantage of a large water-power to assist in the economical production of our product right at our threshold, but in studying the methods employed here at Niagara Falls, there is much information that we can take away with us which will lead us to concentrate our works at the most economical point of production in the various cities in which we live, and we can take advantage of the methods of distribution here employed to distribute our current to distant points where we desire to use it, far more economically than we can produce it at those distant points themselves.

The question is often asked by those engaged in the electric light and power business why the companies known as "Edison Illuminating Companies" or "Edison Licensees" should find it necessary to combine themselves into an association. This question is best answered by the fact that the Edison Illuminating Companies all operate under practically the same form of contract with the company that controls the Edison patents; namely, the Edison Electric Light Company. In the main, they purchase their goods, under contract, from the same licensed manufacturer of the patent-owning company—namely, the General Electric Company—and as there is but one Edison company in each particular city, the interests of these various companies are naturally mutual. When I remind you that the various companies which we, either as officers or employes, have the honor of representing here, have invested in their business more than $105,000,000, it will be readily appreciated that it must be greatly to the advantage of the various properties which we operate that we should meet from time to time to exchange ideas as to the proper conduct of our business, and that we should continue an organization to watch over our interests in our dealings with the patent-owning and manufacturing side of the Edison business.

At what happily would appear to be the close of an unparalleled period of industrial depression the various Edison illuminating companies have certainly much cause for mutual congratulation. Notwithstanding this long period of paralysis of industrial enterprise, they have with hardly an exception been able to show good earning capacity and to pay to the holders of their securities a substantial return on their investment. This is partly owing to the inherent merit of our business, partly to the wise foresight of the illustrious inventor whose system this business is based on, and partly to the conservatism of the original projectors of the Edison lighting and power business, who insisted that the Edison illuminating companies should be established on a sound financial basis.

This experience during the depressed times will necessarily lead investors to the conclusion that the securities of the Edison illuminating companies are amongst the most desirable of local investments, as if it is possible to earn substantial returns on capital invested during such periods of business disturbances as that which we have recently gone through, surely we can look forward to laying up a substantial surplus to provide against a "rainy day" during times of prosperity which all of us hope and some of us think we are now entering upon.

The use of large generating units in the large stations for the production of electrical energy inaugurated but a few years ago, and the necessity of extending the field of our operations into distant portions of our territory has forced upon many of us the desirability of employing more economical methods of transmission, with a view to the abandonment of small and expensive stations and the concentration of our production of current at the point of greatest economy. This matter was touched upon to a certain extent during the last convention. A number of our companies are now spending large sums of money on these lines, and as a result of the importance that this subject has assumed, it is but natural that a considerable portion of our time will be occupied in deliberating on this subject.

In connection with the matter of economical transmission, the subject of economical storage is naturally of importance, and we should, in the course of our proceedings, be able to obtain considerable information on the advantages of the use of the storage battery in connection with the Edison system from those who have had the courage of their opinions and have invested largely in storage battery plants. I think we all concede the advantages to be obtained from the use of the storage battery from the storage point of view only, but some of us are still in doubt as to our ability to have sufficient money from their use to justify the large investment in capital they call for.

A subject of prime importance with the economical production of our product is the basis upon which we shall sell it to our customers. It should be remembered that we are engaged in a public business, and that our companies have duties to perform to the public as well as money to earn for our security-holders. In fulfilling our obligations to the public the question of the basis of charging for our product is the all-important one. This is a matter which on previous occasions has received your earnest attention, and is one on which there will undoubtedly be earnest discussion on this occasion.

For several years past some of the larger illuminating companies, members of this association, notably those of Boston, New York and Chicago, have been in the habit of comparing the details of cost and selling price of their product, their accounts being kept on the same basis as near as local conditions permit. The information obtained, so far as my experience goes, has been of great advantage in enabling the companies in question to reduce their cost and assisting them to an intelligent decision as to the policy to adopt towards their customers. It seems to me that it would be advantageous to the members of this association if a uniform system of accounts were adopted and arrangements made to compare the results obtained by the various companies operating under similar conditions. In putting such a scheme into operation a number of difficulties would naturally have to be overcome, such as the differences in local conditions and the necessity of carefully guarding information of so confidential a character, but I would suggest the desirability of the association instructing the executive committee to take this matter up, with a view to formulating a plan which might be tried experimentally.

The changes that have taken place from time to time since the formation of this association have rendered it desirable that some modifications should be made in our by-laws. A report will be made to you during our meeting setting forth the changes suggested which have been discussed and approved by the executive committee of your association.

The main business of your executive committee during the past year has been the negotiating with the General Electric Company of a contract and specifications with relation to the incandescent lamps used by the Edison licensees, who are members of this association. As a result a lamp-testing bureau has been established at the lamp factory at Harrison, N. J., which bureau is under the control of this association, and is operated for its account by Mr. Wilson S. Howell. A number of our members have taken advantage of the arrangements made, and we believe that considerable benefit will accrue to those who arrange to purchase their lamps under the contract in question.

Great credit is due to the chairman and members of the executive committee for the results they have been able to achieve, and they are certainly deserving of our thanks for the time and money they have spent in this matter for our benefit. I think, for the first time in the history of the electric lighting business, we are now able to obtain lamps made according to specifications agreed on, and the results must be an improvement in our service and a saving of money to our central station companies. The details of this matter will be carefully dealt with in reports by Mr. C. L. Edgar, chairman of the executive committee, and Mr. Wilson S. Howell, the testing officer in charge of the bureau at Harrison.

The relations of the Edison licensees with the Edison Electric Light Company and its licensed manufacturers, the General Electric Company, have, during the past year, been of the pleasantest character. This is probably owing to the fact that those operating the General Electric Company, since the consolidation of the Thomson-Houston Company and the Edison General Electric Company, have had fuller opportunity, as time has gone on, to appreciate the importance of the Edison licensee business to the patent-owning and manufacturing interests.

The matter of patents continues to be in far from a satisfactory condition, the licensees receiving very little protection in the enjoyment of the exclusive privileges under the Edison patents, which they had every reason to look for in view of the large amount of royalty paid by them to the patent company. It is doubtful whether the Edison Electric Light Company or the General Electric Company can be held responsible for this state of affairs, as they have continued to spend very large sums of money in the prosecution of their patent rights in the courts.

It is to be regretted that many of the electrical manufacturing companies continue to foster opposition central station plants in territory already covered by good paying illuminating properties with the result of seriously affecting the credit of the customers upon whom the manufacturers must rely for trade, if they desire to create a permanent manufacturing business. We have all of us suffered more or less from this policy of the manufacturing interests, and while in some cases there may possibly be a temporary advantage to one or another manufacturer, it is natural for us to wonder what permanent advantage can come to the manufacturing interests as a whole by the adoption of methods which would seem to have in view the ultimate destruction of the goose that lays the golden egg.

With the many changes that must of necessity take place in so new a business as the electric light and power industry, the question is often raised as to whether or not our plant is of a permanent character. A close examination of the Edison system must bring home to any one the fact that the wonderful inventive and engineering talent displayed by Mr Edison in his early work has given us the advantage of a system that is of the utmost permanency. Our main investment, in the larger cities at least, is in our underground work, and if you will look over the records of the various companies using the Edison system, I think you will find that their underground work is as useful to them now as when it was laid, and it seems to me that there is no reason for us to fear that this condition will change in the future. We may have different methods of illumination; we may get a higher voltage lamp; we may find that the current of the future will not require as large a cross section of copper as in the past, but I doubt if we will find that any method of distribution will be invented that will supplant that which we are using; and if such be the case, we should rather welcome than fear new inventions, feeling that in our own particular cities we are the most desirable purchasers of any inventions which may lessen the cost of electrical energy to our customers. When those of us who have been connected with this great industry from its early childhood recall the fact that scientists and inventors on both sides of the Atlantic persistently condemned the scheme originally laid out by Mr. Edison, we must, as central station managers of to-day, feel that we owe a deep debt of gratitude to him for his courage in insisting that the only practicable method of distribution of electrical energy was by the use of a constant pressure and a varying current when everybody else was talking a constant current and a varying pressure. This is no occasion for invidious comparisons, but with every desire to pay the highest tribute to the many brilliant men who have contributed to the success of the business of manufacturing and distributing electrical energy, we venture to claim that their work is all subordinate to the master mind who persisted in the early experimental days at Menlo Park in working on a multiple arc system, without which (with the exception of the series arc light) no form of electric light or electric energy could be commercially operated to-day.

Reports of committees followed, and among these was the report on new by-laws, which was adopted.

Mr. L. A. Ferguson, of Chicago, read a paper entitled "Economy in Distribution of Electrical Energy," which was followed by discussion. It appears with discussion elsewhere in this issue.

The association then adjourned until 7.30 P. M., spending the afternoon in visiting the power-house of the Niagara Falls company and other points of interest.

In the evening Mr. Geo. R. Stetson read a paper entitled "The Photometer as Used in the Gas Industry," which was followed by discussion.

TUESDAY EVENING.

Mr. Geo. R. Stetson read a paper describing and illustrating the use of the photometer in the gas industry; the unit of measurement being the English standard candle and the photometer being of the Bunsen type.

In the discussion, Mr. J. W. Lieb, Jr., referred to the Brodhun photometer and the Hefner von Alteneck standard light; with incandescent lights as secondary standards, and compared certain details of these devices. He also called attention of the members to the arrangements which had been made for the supply of calibrated incandescent lamps of 16 candle-power for practical use as station standards.

Mr. S. Dana Greene noted the difference among authorities as to classification of incandescent lamps; some classifying lamps by mean spherical candle-power, and others adhering to the customary classification by mean horizontal candle-power; which subject was further discussed by Mr. John Howell and Mr. R. R. Bowker.

Mr. Caryl D. Haskins presented an illustrated paper describing "Recent Developments in Electrical Measuring Devices"; the devices being a prepayment wattmeter, improved station wattmeters and telltale dials for the same; storage battery wattmeters, showing the state of charge of a storage battery, and new switchboard instruments. The discussion following was generally taken part in by the members, and was in the main an exchange of experiences with meters.

The committee on acetylene gas and Welsbach burners presented a report, which was accepted.

WEDNESDAY MORNING.

The report of the treasurer was presented and accepted.

Mr. J. W. Lieb, Jr., read a paper on "Methods of Charging for Current." He discussed 10 methods in use as follows: Flat rate. Flat rate with connection to circuits shut down at agreed hours. Discounts based on duration of demand, based on the stated time of closing of the customers' premises. Special rates for motors. Discounts on gross bills. Discounts based on average use per day of units installed. The Hopkinson system—a fixed annual rental based on customers' load factor, and an additional charge per unit used. Double discounts; one on gross bill and a second discount based on average use of installation. The "Wright" system with demand

meter. The "Kapp" or double rate system; maximum rate being charged at the hours of the peak of the station load and a lower rate during the remainder of the 24 hours. And he presented a set of tables showing the rates and methods of charging of 12 large stations.

In a written discussion Mr. A. S. Knight, of Boston, acknowledged the value to the industry of the analysis of costs which had been made and published by English electric light men, particularly Mr. Arthur Wright; admitted that American rates had been generally made with too little analysis of cost of product; but objected that the Wright system went too far in the other direction by disregarding the wholesale feature of sales to large consumers.

Mr. W. S. Barstow read a written discussion and showed diagrams which emphasized the effect on cost of product at different hours of the the experiences and opinions of each being given.

THURSDAY MORNING.

Mr. Chas. E. Pattison presented a paper entitled "Storage Battery Progress and Results in the Edison Boston Stations." The paper embodied a record of three years and six months' experience with the first battery, two years and three months' with the second and one year's with the third. His conclusions were that his company's experience to date indicated great benefits from the batteries, and that while they had weaknesses, the expense of maintenance was not so great as for some of the other apparatus in use. The most notable benefits were the better regulation of pressure on the system, particularly the elimination of fluctuation due to intermittent motor loads such as direct-connected elevators; the improvement of generating economy due to the custom of charging the batteries during hours when the load demand variation from hour to hour, and accented the value of a high load factor in reducing possible selling price. He recommended the double-rate system of charging with a constant minimum rate in effect at all but the "peak" hours, the minimum rate being calculated to begin with; and any readjustment toward lower rates due to reduced cost of production to be made by lengthening the hours during which the minimum rate should be in effect. The "Kapp" system, and a Kapp meter made from one of the common type of meters by the addition of a self-winding clock attachment, were his preferences as to the manner of applying the double rate.

A general discussion ensued; questions being asked of the delegates who had spoken in order to elucidate their methods of apportioning costs of production, and the subject being one of special interest it was resolved to take it up again at the evening session. Adjourned.

WEDNESDAY EVENING.

The discussion continued in general, many delegates taking part, would otherwise be light and the reduction of expense hitherto necessary in keeping furnaces banked and engines ready for emergency use.

The discussion by Mr. R. R. Bowker, Mr. W. S. Barstow, Mr. J. W. Lieb, Jr., Mr. L. A. Ferguson, Mr. Samuel Scovil and others, showed differences of opinion among the members having experience with batteries as to which of the advantages to be gained by their use was of primary importance, the expressions varying between those given by Mr. Pattison and that by another delegate, who was of opinion that the immediate availability of the battery as a reserve in case of accident to the generating plant was its principal recommendation.

Mr. J. W. Lieb presented the report of the committee on storage batteries, which, among other matters, contained a recommendation that a rating of battery capacity more conservative than that heretofore in use by the manufacturers should be adopted.

The report of the executive committee and the report of the lamp-testing bureau, presented by Mr. Wilson S. Howell, the chief of the testing bureau, were read and referred to the afternoon session for discussion.

THURSDAY AFTERNOON.

The reports referred from the previous session were fully discussed, and after electing officers and executive committee for the ensuing year, the convention adjourned.

The following is the list of officers elected: President, Samuel Insull, Chicago; vice-president, R. R. Bowker, New York; secretary, Wilson S. Howell, Harrison, N. J.; treasurer, W. S. Barstow, Brooklyn; executive committee: Charles L. Edgar, Boston; Alex. Dow, Detroit; George R. Stetson, New Bedford; J. W. Lieb, New York; Samuel Scovil, Cleveland.

Electrolytic Chlorate of Potassium.

Well known Buffalo, N. Y., business men are behind a new manufacturing industry—the production of electrolytic chlorate of potassium. The corporation is known as the National Electrolytic Company, is capitalized at $200,000, and the directors include State Comptroller James A. Roberts, Tracy C. Becker, Henry Koons, Edward Michael, of Buffalo; Charles W. Hackett, of Utica; William T. Gibbs and Stanislaus P. Franchot, of Buckingham, Que. Mr. Hackett is the well known republican politician; Mr. Gibbs is an English chemist, and Mr. Franchot a dynamite manufacturer. The company will have for officers, Edward Michael, president; Henry Koons, secretary, and Tracy C. Becker, treasurer. The factory will be located at Niagara Falls, and a contract for 1,000 horse-power of electric current has been made.

Telephone Switchboard Wanted.

Mr. Thos. M. Ferguson, real estate agent, of Hattiesburg, Miss., informs the ELECTRICAL REVIEW that he is in the market, with spot cash, for a 100 point up-to-date telephone switchboard to replace a 50-point board now in use and 30 telephones.

NEW YORK STREET RAILWAY MEN.

ANNUAL MEETING AT NIAGARA FALLS —A NUMBER OF INTERESTING PAPERS DISCUSSED.

The fifteenth annual meeting of the New York State Street Railroad Association was held at the International Hotel, Niagara Falls, N. Y., September 14 and 15, 1897.

President G. Tracy Rogers, of Binghamton, called the meeting to order on Tuesday morning at 10.45 o'clock.

The roll was called, and it was found that the following gentlemen were in attendance at the meeting:

GROUP OF DELEGATES ATTENDING THE CONVENTION OF THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK, INTERNATIONAL HOTEL, NIAGARA FALLS, N. Y., SEPTEMBER 14 AND 15, 1897.

DELEGATES OF STREET RAILWAY COMPANIES.

John W. Boyle, president Utica Belt Line Street Railroad, Utica, N. Y.
J. C. Brewster, superintendent N. F. & S. B. Railroad Co., Niagara Falls, N. Y.
J. B. Cahoon, general manager Elmira & Horseheads Railway Co., Elmira, N. Y.
J. P. E. Clark, general manager Binghamton Railroad Co., Binghamton, N. Y.
H. S. Cooper, Schenectady Railway Co., Schenectady, N. Y.
Wm. W. Cole, West Side Railroad Co., Elmira, N. Y.
Chas. Cleminshaw, president Troy City Railway, Troy, N. Y.
R. E. Danforth, Buffalo, Bellevue & Lancaster Railway, Bellevue, N. Y.
W. Caryl Ely, president Niagara Falls & Buffalo Railway Co., Niagara Falls, N. Y.
H. C. Evans, Nassau Electric Railroad, Brooklyn, N. Y.
J. H. Stedman, Rochester Railway Co., Rochester, N. Y.
Thomas H. Fearey, Buffalo, N. Main Street & Tonawanda Railway Co., Buffalo, N. Y.
Wm. E. Havens, superintendent Citizens' Street Railway Co., Fishkill-on-Hudson, N. Y.
W. A. Heller, Lewiston & Youngstown Frontier Railway, Lewiston, N. Y.
Chas. B. Hill, Niagara Falls & Suspension Bridge Railway, International.
A. L. Johnson, president Nassau Railroad, Brooklyn, N. Y.
Henry A. Johnson, Metropolitan Street Railway Company, No. 621 Broadway, N. Y.
Godfrey Morgan, Buffalo Street, Main Street & Tonawanda Railway Co., Tonawanda, N. Y.
C. K. Marshall, Niagara Falls & Buffalo Railway, Niagara Falls, N. Y.
Ambrose P. McCabe, Metropolitan Street Railway Co., No. 621 Broadway, N. Y.
F. P. Mooney, C. & H. Traction Co., Cortland, N. Y.
F. G. Maloney, electrician, Elmira & Horseheads Railway Co., Elmira, N. Y.
John H. Mafflt, Rapid Transit Railway Co., Syracuse, N. Y.

(Continued on page 144.)

ELECTRIC RAILWAY NOTES.

A mortgage for $36,861.45 has been given by the East Oakland, Cal., Street Railway Company to secure notes for the judgments under which the road was sold.

A movement is to be started in Cincinnati within the next few days to compel the Cincinnati-Kentucky street car companies to vestibule their cars before the Winter shall set in.

The increase in gross earnings of the Citizens' Street Railway, of Indianapolis, Ind., for August over August last year was over $2,800. August, 1897, gross earnings were $83,609. Earnings in September to date show an increase of $1,457.

The Realty Syndicate, of Oakland, Cal., is rumored to be in a way to take in another of the street car lines. It already has all but four, and now it is said to be reaching out for the Piedmont cable line. It is now only a matter of time when the Southern Pacific company and the Haywards line will be the only opposition companies in the city.

The Cincinnati Street Railway Company has resolved to increase its capital four per cent, or $624,000. Stockholders may subscribe at par, purchasing $2 scrip for each share owned. The outstanding stock is $15,600,000, authorized capitalization is $18,000,000, and it is believed the remainder will be issued before long, as the road is extending rapidly.

A permit has been issued to the South Side Rapid Transit Company, of Chicago, Ill., to erect a one-story brick power-house at 3937 to 3959 State street, to cost $65,000. This building will be used for the machinery which will furnish electricity as motive power to operate the company's cars. The power-house will be 199 feet wide, and have a depth of 112 feet.

The stockholders of the Metropolitan Traction Company, of New York city, at a special meeting on September 14 authorized the winding up of that company and the exchange of stock for that of the Metropolitan Street Railway Company. There was represented at the meeting over $24,000,000 of stock out of a total of $30,000,000. The vote was unanimous.

The Blue Ridge Electric Railway and Power Company has been incorporated at Hagerstown, Md. The capitalization is fixed at $200,000. The company intends building a trolley from Waynesboro to Buena Vista, High Rock, Blue Mountain House and Quirauk. The directors, all of Baltimore, are Simon P. Schott, Winfield S. Cahill, Roger W. Barron, Ernst J. Knabe, Jr., August Beck, of T.; W. Riley Weaver, Charles J. Wiemer.

The Central Railway and Electric Company, of New Britain, Ct., recently increased the pay of a number of its motormen and conductors who have been in the service a certain number of years. The increase in wages will amount to about $1 a week for each man. The company has always paid its help a good rate of wages, and as a consequence the men have always given the best of services. Both motormen and conductors are looked upon by the public as efficient, painstaking and gentlemanly.

The Cleveland, Berea & Elyria, Ohio, Electric Railway Company has withdrawn its application for a franchise to construct a spur over the Linndale road. The franchise asked for practically took in the same territory covered by F. C. Goodman to construct a line from Medina, and after considerable negotiating the company withdrew its application. No franchise has yet been given by the County Commissioners, but the probabilities are said to be that it will be given to Mr. Goodman.

Cheap street car fares have gone into effect on the Union company's line, of Saginaw, Mich. According to the recent order of Judge Snow, seven regular tickets will be sold for twenty-five cents. Nine labor tickets may be bought for the same price and a similar number of school tickets. The labor tickets will be good from 5.30 to 8 A. M., and the school tickets from 7.30 A. M. to 4.30 P. M. These concessions were demanded of the receivers by the city as one of the conditions upon which the latter would recognize the bondholders' rights to the franchise.

A Trolley Ride 124 Miles Long.

A local paper, in an article on the electrical street car systems of eastern Massachusetts, gives a description of what is alleged to be the longest trolley trip in the world, it being from Providence, R. I., to Nashua, N. H., through Boston. The start, according to the author's route, is from Market square, Providence, thence through Pawtucket and North Attleboro to Plainville, the only break being between Plainville and Norwood, which is at least 14 miles in length. An extension of the Norfolk Central Line from Norwood to Walpole will be in operation within a very short time, but even then it will only reduce the break about three and one-half miles. The Norfolk Southern Street Railway has been granted locations through the towns of Norwood, Foxboro and Mansfield, but it is hard to say when this line will be built. When it is in operation there would still be a distance of three and one-half miles between Foxboro and Plainville which would have to be covered by carriage.

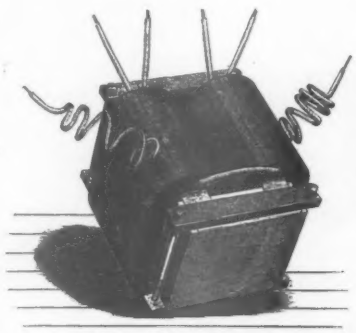
But, even if this line was really in operation covering a distance of 110 miles, it would not be the longest trolley ride in the world, as it is possible to make a trip of 124 miles over lines in actual operation; viz., from the residence of Henry H. Rogers, vice-president of the Standard Oil Company, at Fort Phœnix, in Fairhaven, to Nashua, N. H., the route being through New Bedford, Fall River, Taunton, Bridgewater, Brockton, Braintree, Quincy to Boston, and then through Malden, Melrose, Wakefield, Reading, Wilmington, Billerica, Lowell, Dracut to Nashua.

Farmington, Ct., Plant To Be Rebuilt.

The plant of the Farmington River Power Company at Poquonock, Ct., recently destroyed by fire, will be rebuilt. Plans are under way for rebuilding a substantial fireproof structure, 70 by 40 feet, of brick and iron. The total loss by the fire will aggregate about $35,000, $14,000 for the electric light company and $21,000 for the power company. This loss is practically covered by insurance. The Farmington River Power Company has a capital of $110,000 and bonds of $70,000. It has been a profitable concern from the start, and has regularly paid two per cent quarterly dividends, besides laying up something as a surplus.

A New Transformer.

The new oil type of transformer recently placed on the market by the Kuhlman Electric Company, of Elkhart, Ind., is claimed to possess features of merit not found in other makes. Owing to its ingenious construction practically two turns of



A New Transformer.

wire are obtained as against one turn in other styles. The magnetic joints are also reduced one-half by a novel core construction, and by loosening a few bolts the coils can readily be slipped off the core for purposes of repairs or exchange. The company now has ready a complete line of sizes and voltages, and is shipping them out in large quantities.

Evening Dress in a Street Car.

[*From the Cincinnati Enquirer.*]

He swung aboard a Walnut Hills night car at Fifth street and was evidently angry at having had a long wait, for he complained in audible tones about tired men having to stand on street corners. When he stepped inside and saw every seat taken, a disappointed look came over his face, and he grabbed for a strap with a deep growl. Luck was coming his way, however, for at Eighth street a man near the door got out, and the tired man sank into his place with a sigh of relief. The car then proceeded to the opposite side of the street and stopped to take on a man and a woman. The passengers looked up curiously at seeing a couple in full dress climb aboard. A pale blue silk dress, low cut, and with short sleeves, adorned the woman, and her escort was got up in immaculate dress togs. The man was very gallant, and looked about for a seat for the woman, even trying to get some ladies to sit closer and make room. When this failed, he approached the tired man who had got on at Fifth street and asked him if he would have any objections to giving up his seat. The other looked up in amazement, and said in a decided way that he did object. The man then said:

"I think it is very mean in you to allow a lady to stand in a car."

Quick as a flash the tired man burst out:

"I think it's damn mean in you to make her ride in a street car in that dress."

Roars of laughter from the passengers followed. The couple alighted at the next street, and the tired man once more sank into repose.

Telephone Progress in Maryland.

The Chesapeake & Potomac Telephone Company will introduce the metallic circuit into their Hagerstown system. The Maryland Telephone Company will build their system with the metallic circuit. The Chesapeake & Potomac Company have received 60 new instruments. By them a call to the exchange is made by simply taking down the receiver. The Chesapeake & Potomac rates are the same—$36 a year for business houses; $30 a year for dwellings, where only one telephone is on a line; $24 for business houses; $18 for dwellings, where more than one telephone is on a line. Maryland company's rates are $24 and $18 straight.

LITERARY.

The question "Are College Professors Contented?" will be discussed by Prof. Bliss Perry, in the October *Scribner's.*

McClure's Magazine for October will contain a description of what must be one of the most curious and thrilling spectacles in all the world—an elephant round-up in Siam. The paper will be illustrated from a series of photographs showing the various steps in the dangerous proceeding of driving 200 wild elephants into a corral and choosing out such as are desired for the royal elephant stables and bring them into subjection.

"Theory of Electricity and Magnetism," by Charles Emerson Curry, Ph. D., with a preface by Ludwig Boltzman, Ph. D., cloth, 442 pages, 35 illustrations, price $2.50, sent postage free on receipt of price by the Electrical Review Publishing Company, Times Building, New York.

A man once said that whenever he sat down to read an article by Henry James he always provided himself with a nut cracker. The electrician who tackles this book will need at least a pair of nut crackers. The author endeavors to present in this work a system of philosophy of electricity and magnetism, which to the average reader is so complex as to be entirely without interest. There are, no doubt, an extremely small number of electrical men who would be interested in this work. The volume also includes two long chapters on Von Helmholtz's theory of electricity and magnetism.

ELECTRIC LIGHT FLASHES.

The Common Council of Rensselaer, Ind., has purchased the electric light plant for $7,500.

Judge C. G. Hanford of the Federal Court, at Seattle, Wash., has been asked to appoint a receiver for the Tacoma Gas and Electric Company, of Tacoma.

The University of Georgia, at Athens, Ga., will put in a new plant, consisting of three or four dynamos and several motors, for the benefit of the electrical students.

Last week a contract for furnishing electricity to operate a motor on the new Jackson street bridge, at Newark, N. J., was awarded to the People's Light and Power Company.

The electric light plant owned by Byer Brothers & Company, of Morton, Ill., valued at $14,000, has been completely demolished by the bursting of the boiler from some unknown cause.

The Palmyra, N. Y., Electric Light and Power Company contemplate increasing their equipment, and in order to secure sufficient money have issued $15,000 worth of preferred stock.

The Portland, Me., Electric Light Company are to make an important increase in the capacity of the plant on Plum street, where an immense chimney stack is being built as a preliminary to enlarged equipment.

The Hamilton, Ohio, electric light plant will shortly increase its capacity. The business has grown rapidly, necessitating the enlargement of its wiring capacity. The plant at present is operating 3,200 incandescent lamps.

At the annual meeting of the Rockville, Ct., Gas and Electric Company, held recently, the following officers were chosen: President, A. M. Young; vice-president, Geo. E. Terry; treasurer, F. W. Marsh; secretary and general manager, D. F. Burritt.

The August statement of the Edison Electric Illuminating Company of Brooklyn, N. Y., makes the following showing:

	1897.	1896.	Increase.
Gross.....	$65,094	$60,653	$4,441
Net.....	23,776	19,059	3,717
Gross, eight months.....	561,721	523,083	38,638
Net.....	226,519	196,331	30,188

The August statement of the Edison Electric Illuminating Company of New York, including the high-tension systems, is as follows:

	1897.	1896.	Increase.
Gross.....$	170 347 66	$ 155,016 91	$ 15,330 75
Net.....	66,229 50	54,379 31	11,843 28
Gross eight months..	1,561,567 45	1,417,812 87	143,754 58
Net, eight months..	696 971 61	596,182 86	100,788 75

The Freeland, Pa., Electric Illuminating Company on October 1 will reduce the price of commercial arc lights from $6 to $5 per month. The lights usually burned until 12 o'clock, but on and after October 1 they will be extinguished at 11 o'clock, which will make the reduction of price necessary.

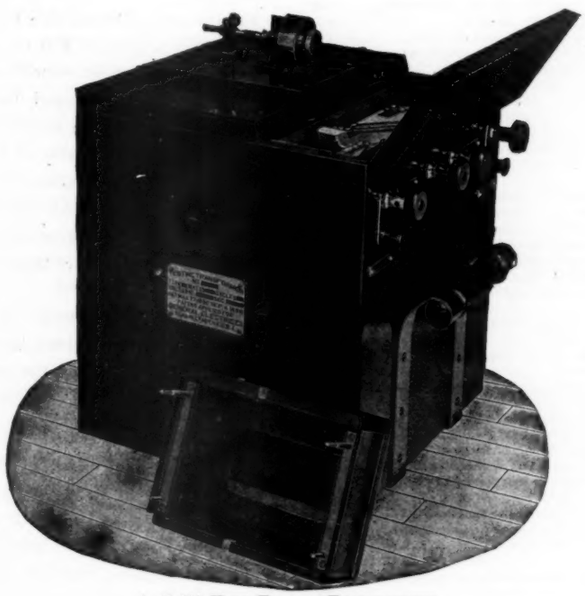
The electrical and steam-heat plant built in the county court-house of Bexar County, Tex., at a cost of $3,400, is now in operation. It will furnish light and water to the court-house and court-house elevators. The county will save nearly $3,000 annually by this plant, which is the only county electric plant in Texas.

At a recent meeting of the City Council of Emporia, Kas., a proposition was received from the Emporia Gas and Electric Light Company to sell the electric light plant to the city for $17,000. The city accepted the proposition. The officers of the gas company claim the plant cost them about $35,000. They were, however, glad to dispose of it at a loss, as they were unable to make a contract with the Council to light the city.

The Sebago Power Company, of Gorham, Me., recently organized for the purpose of supplying electric power to the cities of Portland, Deering and Westbrook, has secured an option on the entire Plummer & Goff property at Gorham, which includes a large amount of land, several buildings and a valuable water privilege. The company's plan is to unite this water-power by means of a canal with that previously acquired, the combined power being considered sufficient to enable the company to deliver 5,000 horse-power in Portland. Work on the power station will be begun immediately. A new dam will be built near the plant of the Indurated Fiber Company.

High-Potential Testing Transformer.

It is a well known fact that electrical apparatus may show high-insulation resistance when tested in the usual manner at low voltages and yet may be easily damaged by the application of a few thousand volts potential. A thin film of air will show almost infinite resistance when measured with a galvanometer, but it offers practically no resistance to the path of a high-tension current. For this reason, when determining the security of apparatus, such as the secondary of a lighting transformer against high-potential charges from the primary circuit, it becomes necessary to test by the direct application of high potential across the insulations to be measured. For this purpose the General Electric Company has developed the 10,000-volt high-potential testing transformer,



A 10,000-Volt Testing Transformer.

which consists of a small transformer wound on a rectangular core similar in construction to that of the "Type H." The low-tension circuit is wound on one branch of the core, and on the other branch the primary coils are placed. There are four primary coils, each wound and insulated independently, the four coils being assembled on a sleeve of heavy insulating material. After assembling, each transformer is tested to a maximum strain of 35,000 volts between the high and low-potential windings, thus insuring safety from accident. By means of a porcelain series multiple connection board, the apparatus can be used on either 52 or 104-volt circuits. The transformer itself is immersed in oil.

On the top of the apparatus is a box with a glass window, inclosing a micrometer spark gap arranged as a shunt across the high-potential terminals. This box or cover carries four long contact studs fitting into sockets in the transformer box. The lifting of this cover for the purpose of adjusting the spark gap entirely disconnects the spark gap from the high-potential circuit. On one side of the transformer case are six terminals, two for the main circuit, two for the adjusting rheostat, in series with the low-potential circuit, the two small terminals providing connections for a voltmeter permanently across the low-potential circuit of the transformer. The transformer case is mahogany; the trimmings of nickled brass and polished hard rubber. The case is provided with two handles for transportation, also with a stop-cock for drawing off the oil when necessary. Provision is made for readily polishing and re-adjusting the points of the spark gap.

When using the apparatus the spark gap is first set to discharge at the limit of voltage desired, readily done either by the use of a calibration curve or by a voltmeter on the low-potential circuit, the ratio of transformation being known. Having adjusted the spark gap, the apparatus under test is connected to the high-potential terminals on the spark gap base and the potential again brought up to the amount desired and held as long as necessary. The apparatus under test is thus connected in multiple with the spark gap, and the accidental application of higher voltage than was intended will merely result in the formation of an arc across the spark gap, short-circuiting the apparatus under test and protecting it from damage. The transformer is designed to run on either 60 or 125-cycle circuits and to deliver up to 10,000 volts at a normal current of .05 ampere in the high-potential circuit. This can, however, be exceeded for shorter periods.

The rheostat used to control the voltage on the low-potential side may be of any convenient type. A small rheostat of portable form for this purpose has also been developed by the General Electric Company. This consists of a vertical tube and stand with a fixed contact plate at the bottom and another plate attached to a sliding rod, the rheostat being filled with water, to which a small quantity of salt or soda has been added.

In the opinion of the engineer of one of the most important electric companies in New York State, "the testing transformer has already proved of great value in testing samples of cable and in testing arc switches for use on our new iron poles. There are so many practical tests in which it can be used that it is difficult to say in which direction it is most useful, as with a sufficiently sensitive ammeter it could be used to determine the static capacity of a short length of cable at the exact periodicity used in practice. But the breakdown tests of insulation in all kinds of apparatus are evidently the most common problems to be met in practical work, and for that alone it is most valuable."

The Street Railway Magnate, the Alderman and the Robbers.

[*From the Chicago Times-Herald.*]

The two highwaymen had followed a street railway magnate several blocks, waiting for a favorable chance to rob him. Suddenly he stopped before the residence of an alderman, ran lightly up the steps, rang the bell and was admitted.

The footpads looked at each other. "Well," said one, "what's to be done now? Shall we wait for him to come out?"

"Naw!" exclaimed the other in disgust. "We'll hev to wait fer de alderman now."

Water-Power in London.

[*From the London Electrical Engineer.*]

There have been many attempts made to use the power of the sea for generating electricity, but Londoners would be thankful if a designing genius would turn his gaze upwards and see if he could not collect and store the water that has fallen from the clouds on to the London streets recently.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, SEPT. 22, 1897.

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A physician in Havana, Cuba, claims to have cured a man of blindness by means of the X rays. It is said that the man can now see, and the question at once arises: Was he ever really blind?

Mr. George Gould returned to New York city last week from a three months' trip to Europe. He at once informed the reporters that he and Mr. Russell Sage had no idea of selling their holdings of Manhattan Elevated Railway stock. He also stated that the directors of the road had no idea of changing the motive power. What a game of see-saw it is!

TWENTY-FIVE DOLLARS FOR ADVICE.

The ELECTRICAL REVIEW frequently receives requests from the parents of young men, as well as from young men themselves, for information as to how best to acquire the training necessary for an electrical engineer. In the past we have been in the habit of answering these inquiries by mail, according to the circumstances of each individual case as we judged them.

We have now decided to offer the following prizes for the best letters of advice as to the proper training required for a young man to become an American electrical engineer. It may be assumed at the start that the young man is not under 18 years old, and has at least a common school education.

For the best letter on this subject we will give a prize of $15 in cash; for the second in merit we will award a prize of $10 in cash, and for the third prize we will give electrical or scientific books to the value of $5, to be selected from the ELECTRICAL REVIEW book catalogue. All contributions seeking the above prizes must be in our hands not later than October 15, 1897.

We place no restrictions on the form of the communications, but suggest that, where possible, the advice be drawn from practical experience.

ELECTRICITY IN THE NAVY.

The comparative merits of steam, electric, hydraulic and pneumatic turret-turning gear on battleships and armored cruisers are being considered by Assistant Secretary Roosevelt, of the Navy Department, with a view to determining which system has the most points of merit. Mr. Roosevelt will save time by eliminating the steam and hydraulic methods. One of the turrets on the "Brooklyn" is operated with perfect success by electricity. Both turrets on the "Texas" are worked successfully by compressed air. We venture the opinion that when the cost of installation and maintenance is considered, as it must be, the electrical method will be found to be the most practical and successful in the majority of cases. There are instances, however, where compressed air is the most available, all circumstances considered. In either case, the installations must be made by men of brains and professional skill. This has not always been the case in the past, as the repair and reconstruction account will show. The navy comprises in its personnel many electrical engineers of unusual talent, which should be recognized in this important matter of turning turrets.

THE NIAGARA FALLS CONVENTIONS.

Two important conventions of particular interest to the lighting and power fields were held in Niagara Falls last week. The Association of Edison Illuminating Companies met in annual discussion and numerous vital and important subjects were treated at length in expert papers and thoroughly commented upon by the many practical and able minds representing the membership of this association. The interesting address of President Insull was impressively delivered and closely followed, and while the entire subsequent programme was a particularly valuable one, the paper on "Methods of Charging for Current" by that pastmaster in station work, Mr. J. W. Lieb, of New York, probably received the most attention and undoubtedly will be of great value to all the members of this association.

Somewhat of a departure was made in the reports given out to the press by the Edison Association. Heretofore their proceedings have been with closed doors and no report of the discussion given to the press. This time a summary of the papers and the discussions was secured by the technical papers. The meeting was very largely attended, and all in all was considered one of the most important ever held.

The N. Y. State Street Railway Association assembled in annual meeting the same week at Niagara Falls and presented a programme of papers of high grade and great practical importance. The list as published in the ELECTRICAL REVIEW last week was followed and all these will be presented in whole or in abstract in early issues of this journal. The papers by Mr. W. J. Clark on "A Decade of Electric Railway Development" and by Mr. H. H. Vreeland on "Municipal Ownership," deservedly received marked attention. We present Mr. Clark's paper in entirety, and every street railway man in the United States will find it full of interesting historical data, valuable as a work of reference and as a guide for the future.

The ELECTRICAL REVIEW believes that the delegates to the Edison and Street Railway Conventions are to be congratulated over their very successful annual meetings of 1897, and we trust that their gatherings in the future may be as interesting and valuable. It is but proper to mention that the electrical interests of Niagara Falls extended every courtesy to the visitors.

These crisp and cheery autumn days form a fit and pleasing setting to returning prosperity.

SUPPLEMENT TO

Electrical Review.

NEW YORK, WEDNESDAY, SEPTEMBER 22, 1897.

A DECADE OF ELECTRIC RAILWAY DEVELOPMENT.

READ BEFORE THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK, NIAGARA FALLS, SEPTEMBER 14, 1897,

BY WILLIAM J. CLARK.

MR. PRESIDENT AND MEMBERS, NEW YORK STATE STREET RAILWAY ASSOCIATION: An eminent writer on railway subjects has substantially said that a railway is a "machine for the manufacture of transportation."

Were we asked, in a single instance, to cover the full meaning of this paper's title, we might respond with such a quotation, for, most certainly, viewing the true objects of a transportation company in the broadest manner possible, it is to exemplify this theory, and probably in the whole history of transportation no class of managers has done so much to create travel rather than to merely take care of what may seem to be the existing demand, as have those of lines which were contemplated at the same period in New York State were of similar experimental character, so that, commercially, electric traction could not be said to have existed in the Empire State 10 years ago; yet, at the present moment there are slightly over 6,000 motor cars in daily use within the territory covered by your association. But to grasp the extent and rapidity of electric railway development the following comparative statement, covering all the street railways in the United States (and never, I believe, given in this form to the public), will best serve as an illustration.

(Mr. Clark, speaking: And, Mr. President, noticing that the Board of Railroad Commissioners is represented at this meeting, I trust that I may be pardoned for interjecting a few remarks concerning them personally. During many years of experience with railway statistics, covering both the United States and foreign countries, I have never seen figures which meant so much as those which are published by the railroad commissioners of this State. Neither have I, in my experience, met public officials who were so willing to furnish information to

It may be said that all of the wonderful progress above shown by the street railway interests can not be directly attributable to electricity, as an introduction of cable in New York city is, to a certain extent, responsible for such progress, yet as the effect of the cable traction on our general proposition is so similar to that of electricity, and as New York is so fast becoming an electric traction city, it is considered unnecessary to go into the refinement of subdivision of mechanical traction methods in their effect, for both tend to demonstrate the theory which we have advanced, and show that as great benefits have been conferred upon the community served as can be done consistently with the financial investments, in the corporations, and, unquestionably, to a certain extent, show also that in development which discounts the future, resulting in the public benefit referred to, the interest of stockholders may not have been as thoroughly promoted as if a less liberal policy had been pursued. Yet some of the figures, unless further explained, might be grasped by those who advocate municipal ownership, reduced rates of fare and additional burdens upon certain additional amounts paid by the holders of securities of lesser and other companies, or certain percentage contributions which, if calculated together, would compare favorably in amount with the demands for percentage payments made by some of the loudest advocates of such theories. A little calculation will also show that the street railway companies maintain about 9,000,000 square yards of street surface, or paving, the practical equivalent of maintaining a street 250 miles long; yet, as is well known, with the now rare exception of horse railways, the street railways of New York State do not wear the surface of the street at all, but their tracks unquestionably save much wear from vehicle travel, as compared to the ordinary roadway, which must be maintained by the municipality. Remember, these burdens are imposed for the privilege of running the "poor man's carriage."

From a calculation based upon the census returns of 1890, the average tax rates of the various cities in New York State, the owner of an ordinary carriage or vehicle pays, proportionally, only about one-sixth as much for his privilege of going where he

COMPARATIVE GENERAL STATISTICS ON ALL OPERATING RAILWAY COMPANIES, NEW YORK STATE, 1887–1896.

	Surface Steam Roads.				Elevated Steam Roads.				Street Railways.			
	1887.	1896.	Inc. or Dec.	Per Cent Inc. or Dec.	1887.	1896.	Inc. or Dec.	Per Cent Inc. or Dec.	1887.	1896.	Inc. or Dec.	Per Cent Inc. or Dec.
Gross earnings, freight and passenger traffic	$143,724,490 62	$210,089,592 75	$66,365,102 13	46.09	$8,691,439 49	$11,896,461 45	$3,205,021 96	36.87	$17,966,518 31	$28,808,898 84	$10,842,380 53	60.35
Operating expense, freight and passenger traffic	92,489,974 60	146,063,417 17	53,573,442 57	57.96	4,962,148 96	7,154,581 22	2,192,332 26	44.20	13,291,855 32	17,848,759 27	4,556,903 95	34.31
Net earnings from operation	51,284,516 02	64,026,174 98	12,741,658 96	24.87	3,729,290 53	4,741,880 23	1,012,589 70	27.18	4,674,662 99	10,960 139 57	6,285,476 58	134.6
Income from other sources	5,458,671 31	7,132,210 88	1,673,539 57	30.80	87,659 06	247,119 87	159,460 81	182.00	320 933 8	1,428,192 86	1,108,259 48	346.4
Gross income from all sources	56,738,187 33	71,158,385 86	14,420,198 53	25.90	3,816,949 59	4,989,000 10	1,172,050 51	30.72	4,996,596 37	12,388,332 43	7,391,736 06	148.1
Interest	17,469,522 21	23,052,019 30	5,582,497 09	32.00	1,781,442 29	3,104,125 36	1,322,683 07	74.24	1,565,711 62	3 351,770 31	1,786 058 69	114.15
Rentals of leased lines	14,702,117 28	20,710,892 89	6,008,775 61	40.80	20,000 00	68,225 00	48,225 00	241.1	342,318 00	3,833,211 91	3,490 893 91	102.0
Taxes	5,018,907 21	7,781,589 34	2,762,482 11	55.01	478,291 82	895,830 31	417,535 48	87.40	899,192 49	1,164,820 40	335,627 91	40.4
Miscellaneous deductions from gross income	1,089,097 49	1,390,260 29	350,562 80	33.72					54,747 97	170,998 42	116,245 45	212.6
Total deductions from gross income	38,230,244 19	52,934,561 80	14,704,317 61	52.30	2,279,737 12	4,068,180 67	1,788,443 55	78.53	2,791 970 08	8,520,796 04	5,728 825 96	205 3
Net income from all sources	18,507,943 14	18,223,824 06	284,119 08	1.53 dec.	1,537,212 47	920,819 43	616 393 04	40.1 dec.	2,203,626 29	3,867,536 39	1,663,910 10	75.52
Dividends	10,207,885 50	14,557,454 00	4,349,568 50	42.12	1,560,000 00	1,800,000 00	240,000 00	15.38	1,415,397 50	3,379,953 95	1,964,556 45	113 95
Miscellaneous payments from net income	15,614 04	102,554 13	86,900 00	555.10					36,128 76	8,508 73	27,625 03	76.7 dec.
Surplus	8,281,403 60	3,563,815 93	4,720,587 67	87.00 dec.	24,787 53	879,180 57	856,393 04	876.5 dec.	795,100 03	479,078 71	273,021 32	36.23 dec.
Percentage operating expenses to gross receipts	64.42	69.52	5.1	7.92	57.08	60.14	3.06	5.36	73.98	61.96	12.02	16 26 dec.
Percentage net income to capital stock	3.5	2.43	1.07	30.6 dec.	4.79	1.91	2.88	60.13 dec	6.80	3.61	3.28	47.65 dec.
Percentage dividends to capital stock	2.10	2.40 5.39	.3	13.7	4.9	3.73	1.17	23.90 dec.	4.5	5.08	.58	12.80
Percentage gross income to cost road and equipment	4.81		5.8	12.07	7.96	5.02	2.94	36.93 dec.	8.58	4 8	3.78	44.05 dec.
Total passengers carried	94,272 116	179,315,449	83,043,333	90.45	172,858,082	235,390,148	62,972,066	36.53	361,543,920	672,498,760	310,954 880	86.1
Passenger earnings per mile traveled*	$2 36	$2 22	$0 14	5.94 dec.	$5 04	$4 05	$0 01	.2	$4 97	$4.28	$0 69	13 90 dec.
Passenger expense per mile traveled*	1 51	1 64	0 13	8.61	2 88	3 04	0 16	5.56	3 68	2.65	1 03	28.00 dec.
Passenger profits per mile traveled*	0 85	0 58	0 27	31.73 dec.	2 16	2 01	0 15	6.94 dec.	1 29	1.63	0 34	26.35
Miles of track in New York State	12,948.41	14,401.25	2,159.81	17.57	109.81	167,743	57,998	52.75	908.91	1,736.99	828.08	91.15
Gross earnings from operation per mile of road operated	$12,090 08	$13,787 21	$1,697 18	14.04	$79,140 69	$70,921 73	$8,218 96	10.38 dec.	$19,765 12	$16,591 25	$3,173 87	16.07 dec.
Operating expense per mile of road operated	7,776 00	9,585 47	1,809 47	23.32	45,103 60	42,652 60	2,450 80	5.45 dec.	14,622 49	10,275 60	4,346 80	29.68 dec.
Net earnings from operation per mile of road operated	4.314 08	4,301 74	112 29	2.61 dec.	34,037 09	28,268 93	5,768 16	16.94 dec.	5,142 63	6,325 65	1,183 02	23.05
Average number of employes for year	102,634	146,987	44,353	43.22	5,136	7,120	1,984	38.66	13,873	23,952	10,079	72.70
Combined net income of operating companies and dividends of leased companies, constituting entire net income of all roads	$22,122,981 74	$22,337,604 59	$214,662 85	.97	$1,537,212 47	$920,819 43	$616,393 04	40.1 dec.	$2,226,974 29	$3,774,229 72	$3,547,255 43	159 3

*On Street and Elevated Railways these figures are given "per passenger."

American street railways since they have had at their command that most flexible of transportation agents—electricity. In carrying out this broad-gauged policy, they have benefited communities and the general public to an extent that is beyond any estimate that can be placed upon the same, and while it is true certain benefits have accrued to their stockholders, these do not begin to aggregate the blessings that electric traction has conferred upon those who are frequently the most anxious to condemn it as a motive power. It is with this phase of the situation that this paper will deal, rather than elaborating upon the conquests that have been achieved in the technical and engineering branch.

Going back to the commencement of the present decade, there was in your State but one electric line, and that at Binghamton, some three miles in length, and this particular road, although it enjoys the distinction, Mr. President, of being the nucleus around which you have built an extensive and model electric railway system, you will concede was experimental in its character, and that those other small those who desired it for a legitimate purpose as these gentlemen. Applause.)

From such statement it should be noted, not only the tremendous increase in percentage of electric traction to the total, approximately 15,000 per cent, but also the fact that the street railway mileage of the United States has increased over 156 per cent during the period given. During the same interval, the mileage of American steam railways has increased but 31 per cent. This fact in itself would seem to demonstrate that the American street railway men have grasped the possibilities of building up transportation in a more thorough manner than have their brethren of the steam railway fraternity, as well as demonstrating the theory which we have advanced. But for a more immediate illustration of the comparative growth, as well as some other startling facts, let us come nearer home and introduce a comparative statement compiled from the reports of the railroad commissioners of the State of New York for the years 1887 and 1896, covering street railways, surface steam railways and steam elevated systems.

street railway corporations, as demonstrating the theories of increased earnings, reduced operating expenses and other things which they consider sufficient reasons for advocating the practical confiscation of vested rights of the greatest benefactors, in a corporate way, communities have ever had. True, street railway earnings have increased and operating expenses have decreased, and many other advantages have come to the street railway companies through the introduction of electricity, but for every dollar of actual net return which the investor in street railway securities has received in the Empire State, we do not hesitate to say that the municipalities and the general public have received at least $10 direct benefit, and that the general public has thus profited far more greatly from the advantages of rapid transit than have the investors who produced it.

Let us consider some of the figures quoted. In 1896 the operating street railways of New York State paid $1,164,830.40 in direct taxes—a good sized percentage in itself on gross receipts, as will be noted. This, let it be remembered, does not include will with the same and wearing out the pavements at pleasure.

One of the results for which, I presume, electricity must be to a certain extent held responsible, owing to the expectation of greater returns and other excuses made by municipal officials for unreasonable assessment, is inequality of taxation. To illustrate this point we interject here a somewhat surprising calculation, compiled from the railroad commissioners' report for 1896, which would seem to demonstrate that valuation of property, earnings, passengers carried, car miles run, or no other intelligent basis of assessment of taxation on street railways in this State has been followed, and that certain hardships have resulted, is, we think, clearly apparent.

But to return to our analysis of the general statistics given, it is to be regretted that the data are not attainable which would show the exact increases in valuations of real estate, caused directly by the extensions of street railway lines during the past 10 years. We believe, however, that such increases in New York State amount to $800,000,000, a direct gain to the holders of

abutting and adjacent property and a direct benefit to the State and municipalities by increasing the amount of taxable property. This, it will be noted, is more than the entire investment in street railway properties.

Let us make another calculation. It is certainly reasonable to suppose that the extensions of street railway lines, and faster service obtained, during the past 10 years, saves to each passenger at least 10 minutes of time. This means annually to the citizens of New York State a saving of 112,083,127 hours. Consider such time to be worth only an average of as low as 10 cents per hour, and we have a saving of $11,208,312, or nearly double the net earnings from the operation on all the street railways of the State.

Looking over our figures, we might be met with that oft repeated statement that street railways have been over capitalized. To this charge we can not but reply that the promoters of some of the street railways have not been entirely guiltless of the sin of over-capitalization to a certain extent, yet far less than is ordinarily supposed. We believe, however, that the aggregate amount of all such illegitimate financiering in connection with the street railways of New York State, since the advent of mechanical traction, is not so great as the unintelligent and wasteful expenditure of public funds in one or two large cities of the United States, for a fraction of this period, and we cheerfully invite the advocates of municipal ownership to devote some study to this feature. Where the money represented by the present investments has gone is in the legitimate purchase of underlying companies or companies ante-dating mechanical traction and inexpensive construction and equipment, which could be duplicated to-day at a much smaller figure. Some illustrations of this feature. In the early days of electric traction, when most of the construction and equipment was done in this State, girder rails cost more than double their present figure; electric car equipments from 250 to 400 per cent more; car bodies from 25 to 35 per cent more; power station equipment from 100 to 300 per cent more. That prices have depreciated is not the fault of the railway investors and managers, and surely does not affect the legitimacy of their investments. The public should feel grateful for the additional incentive which the present low prices now give the railway corporations for offering them still better transportation facilities. Somewhat on the same lines, we should refer to the mistaken impression generally prevailing, even among those who are supposed to have some knowledge of the subject, as regards the entire cost of thorough electric railway construction and equipment. As illustrating this, a few months since I was called upon to prepare a careful estimate on the cost of duplicating an extensive street railway system in the West, where the city engineer had stated that, approximately, $3,500,000 would rebuild the system in accordance with the most approved ideas. The engineer referred to was requested to answer a long list of questions, which practically constituted specifications, as to his ideas on construction and equipment, and a most careful calculation was made by myself and others in accordance with his ideas, the result being that at least $7,500,000 was found to be necessary to duplicate such a system in accordance with the specifications of such engineer. The opponents of the present methods of street railway ownership and operation would probably state that the rapid extension of street railway lines would not have been made had not additional returns been expected by the investors, and that, to a certain extent at least, the results which we have quoted would verify this statement. Yet, far more apparent than this is the fact that with the extensions of lines have come the transfer system and lengthened routes, so that the average nickel will now carry a passenger three times as far on the street railways of New York than it would have done ten years ago; another illustration of the benefits which the public has derived, and it is safe to say we would hear no comments on the fact that the rates per passenger had been reduced during the past ten years. Let us now for a moment consider what might have been the result had the street railway management of New York State, as a whole, been less progressive than it has. All of the large systems are practically the outgrowths of old horse-car companies, which were generally laid out on the principal thoroughfares, affording a large short haulage travel, and which could now be handled in a most profitable way by mechanical traction methods at an average rate much less than upon systems which have extended their lines, so that a large proportion of their mileage is suburban, or through comparatively unprofitable territory. Let us cite a case from actual records showing what the effect would have been. A certain street railway system in a large city, operating about 30 miles of track by horse traction in 1887, equipped its lines with mechanical traction, but has never extended the same. It is well managed and gives magnificent service, but can not be said to have conferred the benefits upon the community which other systems have that have followed the general programme of extension. The following shows the approximate results from its operation in 1887 and 1896:

	1887.	1896.
Gross receipts	$1,346,550 00	$2,680,448 00
Operating Expenses	974,791 00	1,448,157 00
Per cent operating expenses to gross receipts	72.5	54.2
Fixed charges	294,336 00	316,007 00
Net income	77,428 00	886,284 00
Dividends	60,000 00	800,000 00

We think no comment is necessary to illustrate this company's prosperity. Nor does it need any elaborate argument to show that in this particular case at least better results could not have been obtained had extensions been built.

We have heard it claimed that the employés of the street railways companies have not profited as they should through the advanced methods adopted by their companies. A glance at the statistics we have quoted illustrates how their number has increased and the statement herewith will, we think, demonstrate that the condition of the employés of no other large industry in this country has shown as comparatively great improvement in 10 years as has that of the street railway employé in the Empire State.

We regret that time and space will not permit us to make an elaborate comparison of the wages paid street railway employés here with those prevailing abroad, or to demonstrate at length that electric traction increases the labor account, although it produces economy in other directions. We would note, however, that according to the last report of the Glasgow Tramways—the model horse railway system of the world and the ideal of municipal ownership—that the total wages aggregate but 43 per cent of the operating expenses, while on that model of electric street railways, the Buffalo, N. Y., system, as shown by its report for 1896, over 77 per cent of the entire operating expense is paid to labor, while this percentage holds practically good on all the street railways of the State operated by mechanical traction. This analyzed would mean that out of approximately $29,000,000 gross receipts received by the street railways of the State, $13,000,000 are paid directly to employés as wages, while, of course, a goodly share of the remainder of the operating expenses goes indirectly to labor in the production of materials required in connection with operation and replacement. Against this the stockholders of the operating companies get but, approximately, $3,400,000 annually in dividends for their large investment.

Now, as to the most serious of all offenses that have been charged to mechanical traction; viz., accidents: The daily press is constantly filled with references to the "Deadly Trolley," with occasional remarks concerning Mr. Vreeland's cars of "Juggernaut," but what are the real facts concerning this very serious matter, and what are the comparative results between the present and the past on street railways in this State, and how does the annual result compare on street and steam railways? According to the Railroad Commissioners' report of 1896, there were killed on the street railways of New York State 13 passengers, 7 employés and 51 others, making a total of 71. This represents one for each 1,807,316 car miles run, or one for each 9,883,268 passengers carried. Against this number the surface steam railways killed five passengers, 211 employés and 544 others, or a total of 760. This represents one for each 241,950 train miles run, or one for each 235,941 passengers carried. So it is safe to say on fatalities that our steam railway friends are producing the same in the proportion of about eight to one as against the street railways. In the same year the street railways injured 197 passengers, 35 employés and 157 others, or a total of 389. This represents one for each 329,875 car miles run, or one for each 1,7..8,788 passengers carried. During the same period the steam railways injured 174 passengers, 2,142 employés and 592 others, or a total of 2,908, running for each 63 243 train miles, or carrying 61,663. The total killed and injured on street railways was 462, or one for each 277,752 car miles run, or one for each 1,442,016 passengers carried. The total killed and injured on the steam railways amounted to 3,668, or one for each 50,131 train miles, or one for each 48,886 passengers carried. From this comparison it will be seen that if the daily press devoted as much space comparatively to steam railway accidents as to those on street railways they would have room for nothing else in their columns, and might require daily Sunday editions. To listen to some of the comments on street railway accidents it would be supposed that no such thing had ever been heard of until the introduction of mechanical traction, yet in 1887 the street railways of New York killed one person for each 9,983,646 passengers carried, almost the same average as the present, as shown above. They injured one person for each 1,398,487 passengers carried, or proportionately 25 per cent more than in 1896. This, we think, thoroughly demonstrates that mechanical traction is far safer than the horse car in every way. But another surprise: While, as shown, the percentage of accidents has been decreased, the natural inference would be that this improvement had occurred in connection with the passengers or employés, and that with increased speed must come greater danger to those upon the streets. Strange to say, however, the proportion of accidents between 1887 and 1896 to this class is 33⅓ per cent less. It should be remembered in this connection also that the average speed of cars on the street railways of New York State has more than doubled during the past 10 years.

The accumulation of statistics has lengthened this paper far beyond my original expectations, until I fear it has become burdensome, and at the same time I may be accused of treating almost entirely subjects which would only indirectly come under the title, yet you are all practically as familiar as I am with the technical and engineering side of electric traction development, so I trust I may be pardoned for not dilating upon the same, and will close with the brief prophecy that another decade will find electric traction occupying the same position as regards operation of heavy standard railways that it now does toward the street railway.

Now comes the convention of the American Street Railway Association as the next on the list. This meeting, which will be held at Niagara Falls next month, will undoubtedly be the best attended and the most successful gathering of street railway men ever held. Exhibitors are unusually numerous, and the exhibition space has all been allotted. Favorable railroad arrangements will enable the delegates to attend from all parts of the country. This convention, we predict, will be historic.

COMPARATIVE STATEMENT OF AVERAGE WAGES AND SERVICES REQUIRED STREET RAILWAY EMPLOYÉS OF NEW YORK STATE.

	1887 Wages per hour	1887 Hours per day	1896 Wages per hour	1896 Hours per day
Conductors	$ 141	11.79	$.159	10.62
Drivers	.141	11.97	.183	10.40
Starters	.184	11.14	.182	10.90
Watchmen	.142	14 09	.145	11.22
Switchmen	.142	10.68	.149	10.44
Roadmen	.158	10.29	.158	10.20
Hostlers	.131	11.52	.145	10.57
Blacksmiths	.254	10.11	.....	.....
Carpenters	.248	10.14	.200	10.00
Painters	.241	10.22	.200	10.00
Harness makers	.225	10.00	.....	.....
Inspectors	.217	10.70	.235	9.50
Car cleaners	.142	10.50	.....	.....
Tow Boys	.109	12.31	.....	.....
Trackmen	.172	10.80	.....	.....
Repair men	.264	10.01	.....	.....
Foremen	.215	11.50	.200	10.00
Engineers	.220	11.33	.243	10.37
Motormen	.093	14.00	.161	10.73
Machinists	.....	.....	.222	9.98
Mechanics	.....	.....	.219	9.95
Linemen	.....	.....	.198	10.19
Firemen	.....	.....	.159	10.81
Electricians	.....	.....	.227	10.15
Transfer agents	.....	.....	.200	10.00

GENERAL COMPARATIVE STATEMENT OF STREET RAILWAYS IN THE UNITED STATES, JANUARY 1, 1888—JANUARY 1, 1897.

	1888	1897
Total number of operating companies	615	806
Number of street railway systems operated by horses	566	167
Number of street railway systems operated by cable	18	88
Number of street railway systems operated by steam dummies, not including elevated	35	33
Number of street railway systems operated by electricity	21	698
Mileage of horse car track	5,474	1,010
Mileage of cable track	217	515
Mileage of steam dummy track, not including elevated	216	145
Mileage of electric track	86	13,580
Total mileage of street car track	5,993	15,250
Number of horse cars	21,736	3,664
Number of cable cars: grip, 860; trail, 1,917	2,777	5,957
Number of steam dummies and cars: dummies, 165; cars, 258	423	318
Number of electric motor cars, 166; trail cars, 6	172	37,097
Total number of street cars, all descriptions	25,108	47,036
Percentage horse car track to total mileage	.914	.066
Percentage cable track to total mileage	.036	.034
Percentage dummy track to total mileage	.036	.009
Percentage electric track to total mileage	.014	.891
Percentage horse cars to total number	.866	.078
Percentage cable cars to total number	.111	.127
Percentage dummy cars to total number	.017	.007
Percentage electric cars to total number	.006	.788
Average length horse car systems	9.67 miles	6 05 miles
Average length cable systems	12.06 miles	13.55 miles
Average length dummy systems	6.17 miles	4.59 miles
Average length electric systems	4.09 miles	13.02 miles
Largest street railway system (West End Company, Boston), operated by horses	212 miles	430 miles
Largest cable system (that of Chicago City Railway Company)	26.25 miles	
Largest electric street railway system (Richmond Union Passenger Railway, 40 cars)	13 miles	Union Traction Co., Philadelphia.

TAXATION STATISTICS.

CERTAIN STREET RAILWAYS IN NEW YORK STATE, 1896.

	Taxes.	Rate.	Valuation.	Per Cent Valuation.	Per Mile Track.	Per Car Mile.	Per Passenger.
Case One	$17,205	.....	.....	.....	$880.00	.....	.....
Case Two	1,381	.....	.....	.....	283 00	$.00766	$.00328
Case Three	54,537	.....	.....	.....	1,280.00	.01485	.00377
Case Four	1,082	.....	.....	.....	102.50	.00289	.00110
Case Five	3,180	.....	.....	.....	113.50	.00879	.00094
Case Six	22,095	.....	.....	.....	1,175.00	.00947	.00164
Case Seven	289,723	.....	.....	.....	1,442 00	.01847	.00272
Case Eight	24,336	.....	.....	.....	540.00	.00717	.00157
Case Nine	80,525	.....	.....	.....	1,197.00	.01285	.00285
Case Ten	1,189	.....	.....	.....	79.50	.00564	.00025
Case Eleven	1,560	.....	.....	.....	52.00	.00251	.00286
Case Twelve	157	.....	.....	.....	52.50	.00210	.00185
Case Thirteen	648	.....	.....	.....	199.50	.00304	.00083
Case Fourteen	170	.....	.....	.....	39.50	.....	.00032
Case Fifteen	23,399	.....	.....	.....	935.00	.01132	.00355
Case Sixteen	187	.....	.....	.....	31.70	.00240	.00067
Case Seventeen	600	.....	.....	.....	57.20	.00283	.00085
Case Eighteen	24,934	.....	.....	.....	312.00	.00910	.00181
Case Nineteen	1,430	.....	.....	.....	387.00	.01985	.00513
Case Twenty	2,505	.....	.....	.....	224.00	.00495	.00184
Case Twenty-one	1,033	.....	.....	.....	243.50	.00490	.00236
Case Twenty-two	1,475	.....	.....	.....	83.20	.00354	.00119
Case Twenty-three	1,450	.....	.....	.....	162.00	.....	.00139
Case Twenty four	1,151	.....	.....	.....	192.00	.....	.00131
Case Twenty-five	602	.....	.....	.....	140.00	.00635	.00191
Case Twenty-six	600	.....	.....	.....	118.50	.00339	.00227
Case Twenty-seven	1,357	.....	.....	.....	525.00	.....	.00402
Case Twenty-eight	1,498	.....	.....	.....	214.00	.00485	.00097
Case Twenty-nine	4,505	.....	.....	.....	214 50	.00718	.00182
Case Thirty	1,640	.....	.....	.....	577.00	.00675	.00195
Case Thirty-one	427,699	.....	.....	.....	8,550.00	.01890	.00245
Case Thirty-two	1,385	.....	.....	.....	103.00	.00335	.00112
Case Thirty-three	16,273	.....	.....	.....	266.00	.00352	.00114
Case Thirty-four	3,271	.....	.....	.....	593.00	.00779	.00189
Case Thirty-five	5,428	.....	.....	.....	331.00	.01230	.00869
Case Thirty-six	1,736	.....	.....	.....	272.00	.01480	.00426
Case Thirty-seven	860	.....	.....	.....	147.50	.....	.00275
Case Thirty-eight	2,567	.....	.....	.....	153.00	.00467	.00143
Case Thirty-nine	48,814	.....	.....	.....	558.00	.00675	.00282
Case Forty	3,365	.....	.....	.....	216.00	.02850	.00590
Case Forty-one	1,497	.....	.....	.....	306.00	.02140	.00228
Case Forty-two	680	.....	.....	.....	300.00	.....	.00412
Case Forty-three	329	.....	.....	.....	74.30	.00624	.00306
Case Forty-four	778	.....	.....	.....	101.00	.00916	.00812
Case Forty-five	6,777	.....	.....	.....	214.00	.00590	.00172
Case Forty-six	93,519	.....	.....	.....	3,300 00	.00740	.00149
Case Forty-seven	1,689	.....	.....	.....	283.00	.01510	.01515
Case Forty-eight	148	.....	.....	.....	54.00	.00974	.00132
Case Forty-nine	12,769	.....	.....	.....	505.00	.00575	.00127
Case Fifty	18,964	.....	.....	.....	557.00	.00764	.00195
Case Fifty-one	3,002	.....	.....	.....	375.00	.00868	.00085
Case Fifty two	688	.....	.....	.....	222.00	.00437	.00122
Case Fifty-three	587	.....	.....	.....	90.50	.00179	.00105
Case Fifty-four	3,911	.....	.....	.....	286.00	.00518	.00157
Case Fifty-five	1,914	.....	.....	.....	212.00	.00449	.00147
Case Fifty-six	2,651	.....	.....	.....	295.00	.00865	.00215
Case Fifty-seven	814	.....	.....	.....	74.00	.00590	.00140

ECONOMY IN DISTRIBUTION OF ELECTRICAL ENERGY.

READ BEFORE THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES AT NIAGARA FALLS, SEPTEMBER 14, BY LOUIS A. FERGUSON.

Ever since the advent of the Edison central station for the distribution of electrical energy for lighting and power work, it has been the universal practice among the designing engineers of both the parent company and the local companies to confine themselves almost exclusively to the use of the direct current for both transmission and distribution.

Following this idea, it has been customary in the development of the lighting and power business of a large city to erect the original central station in the heart of the business district, laying an Edison underground network in that section and supplying it by feeders from the station.

With the successful lighting of the business district, a demand is created for the electric light in the residence portion of the city, and to supply this the same method is followed as has been employed in the downtown district. Another steam plant must be erected at a central point, and the territory covered by a network of underground conductors. Other districts are covered in the same way, until three, four, and sometimes five, steam stations are generating and supplying electricity to the several portions of the city; in some cases, each supplying its own respective district, and in others, all stations delivering energy into one general network of conductors, covering the whole territory. It has been the practice in some cities to connect the bus bars of two or more stations by means of direct-current tie lines; in some cases the tie lines being used to send current from one station to the other to assist at the time of maximum load, or to charge storage batteries, or even to furnish the entire output during hours of minimum load in the territory supplied at other hours by a generating station.

In all cities of moderate size or considerable importance, the service is furnished 24 hours every day in the year; therefore, the cost per kilowatt hour of operating in the stations having a small load factor will be very high, especially during the hours of minimum load, which is often 16 or 18 hours each day. This has been realized for some time, and many methods have been suggested and employed to reduce the cost of operating the smaller stations in the large cities.

We have all listened to the arguments in favor of the use of storage batteries in conjunction with the steam plant in these secondary stations, and several companies have employed them.

Some of us are using the direct-current tie line from the main station to the secondary station to supply the entire output for the secondary territory during the greater portion of the day, operating the secondary stations as a steam plant from dusk until midnight only.

In Boston a storage battery substation supplies the residence portion, the battery being charged from the network during the time of minimum load, and in that city also a tie line connects the main station in Atlantic avenue with the Head place station, charging a battery in the latter station and also feeding the underground system. The direct-current tie line is economical and useful for carrying during the minimum hours the entire output of a residence district station, or other station, having a small load factor, when the distance between the two stations is not so great that the loss of energy in transmission and the interest and depreciation on the cost of the tie line will counterbalance the saving effected by shutting down the residence district station, but when the length of the direct-current tie line is very long, it then becomes uneconomical, owing to the excessive loss of energy in transmission. The pressure curve of a tie line fed substation, whose underground network is not interconnected with the network supplied by the main station, will be a very bad one, owing to the fluctuations of pressure due to ordinary variations in load, and more especially so if the load on the substation be even slightly unbalanced, which condition causes an excessive drop on the neutral of the tie line.

If, however, the underground network of the main station and the substation be interconnected, and the tie line between the station bus bars be used only to take such a portion of the sub-station output as will be necessary to give the desired pressure at the sub-station bus bar, then the pressure curve of the sub-station will, without doubt, equal in regularity that of the main station, and the use of the tie line under this method will be economical and satisfactory.

While direct-current tie lines between stations over two miles apart are useful at times of maximum load and in cases of emergency, this method is not the most economical for shutting down the sub-station under the ordinary conditions existing in large cities, even when storage batteries are employed in the sub-station.

It has been my belief for several years that the day has passed when we should erect steam generating stations, distributed in the various sections of our large cities, and I feel confident that the greatest and most profitable development in the lighting and power industry will be effected by intelligent combination of the alternating and the direct current, the former being used for transmission and the latter for distribution. I think it is generally conceded by all fair-minded engineers in America, experienced in central station work, that, despite all the advance in alternating-current work in recent years, there has not yet been devised a system of alternating-current distribution which possesses the advantages and simplicity of the three-wire, direct-current system for cities of moderate or large size. This being true, the underground system will remain as it is, and any increase in economy of operation must come from the abandonment of steam generating stations, except one, or possibly two main stations located on the water front, where multiple expansion condensing engines can be employed, and cheap fuel may be obtained. The supplying of the business district will be from the main station by means of the three-wire, direct-current system, if the distance from the station to the electrical center of distribution be less than, say, one mile. The remaining two, three, or more stations, as the case may be, which formerly supplied the outlying territory will be abandoned, as steam generating plants and will become simply substations, receiving their electrical energy from the main station by means of three-phase, alternating-current transmission.

Under conditions where the main station is within a mile of the electrical center of the business district, and the principal output is furnished by the three-wire system, there will be three methods of supplying the sub-stations, the apparatus in the sub-stations remaining the same in each case:

First: In the main station we may install three-phase, alternating-current generators in suitable units to meet the conditions, the combined capacity being sufficient to take care of the entire output of all of the substations. These generators should be built with rotating field and stationary armature and wound for the voltage of the line transmission, which should be from 2,000 to 6,000 volts.

In each sub-station there should be stationary transformers wound to reduce the pressure from that of the line to about 80 volts. The secondaries of these transformers, in sets of three, should then be connected to rotary current transformers in units of proper size to suit the conditions of the load in the sub-stations. The rotaries should be arranged in pairs, each rotary having an independent set of stationary transformers, and having the direct-current side connected to the bus bars of sub-stations on the three-wire plan. They will take the alternating current from the line, convert it to direct current at from 115 to 130 volts, and deliver it to the bus bars for distribution, giving to the customer direct current, as formerly supplied by the Edison dynamos. This method is an exceedingly efficient one, and assuming that the efficiency of the alternating-current generators in the main station is equal to that of the original Edison dynamos in sub-stations, which is very conservative, then the efficiency of the system from the switchboard in the main station to the switchboard in the sub-station will be from 84 to 86 per cent, based upon the following efficiency in apparatus: Rotary transformers, 91 per cent; stationary transformers, 97½ per cent; line loss, 3 to 5 per cent.

The Edison Electric Illuminating Company of Brooklyn has adopted this method of distribution for development of new outlying territory, and is now installing apparatus on a large scale.

The second method, which, though apparently not as efficient as that just described, when the apparatus is considered by itself under full load, will be found exceedingly useful in developing new territory, and for additions to existing plant, and may yet, when all things are considered, prove nearly as efficient as the first method.

Instead of installing in the main station three-phase, alternating-current generators for the express purpose of delivering energy to the sub-stations, we may install in the main stations rotary-current transformers, so wound that their direct-current sides may be connected to the positive and negative bus bars of the main station, and operating conversely to the manner of operating rotaries in the sub-station. They will then take direct current from the main station bus bars, convert it into three-phase alternating and send it through stationary step-up transformers, which will raise the pressure to the desired voltage required for line transmission. The apparatus in the sub-station will be exactly the same as that described in the first method. With this second method we have the advantage of only one kind of generating apparatus in the main station, all direct current on the three-wire plan, and, further, all current required by the converse rotary to supply the sub-station transmission will be obtained from the Edison generators in the main station, thus loading them and their engines and increasing their efficiency of operation. This method is being employed by the Chicago Edison company temporarily, although the apparatus was originally built for the third method, which I am about to describe, and which will ultimately be adopted by that company for all its sub-station work. The apparent efficiency of the second method is 75 per cent, considering the losses in apparatus and line by themselves and not crediting the advantages gained by additional loading of engines and dynamos in the main station.

The third method combines all the advantages of the first and second methods and has none of their disadvantages. The main station in this case is the same as before, having dynamos operated on the three-wire system.

Instead of the three-phase generator, as mentioned in the first method, we will install generators designed and built to give three-phase, alternating current and direct current at the same time in any quantities desired up to the capacity of the machines. These generators will be practically power-driven, rotary-current transformers, and may be directly coupled to the engine, or belted if preferred. They will furnish three-phase, alternating-current to the sub-station transmission line through step-up transformers in quantities sufficient to operate the sub-station, and the balance of their output may be furnished at the same time in direct current to the three-wire bus-bars of the main station. As the demand at the sub-station increases, the quantity of alternating current delivered by the special generators will increase, and the quantity of direct current furnished to the bus bars will decrease correspondingly, until finally, when the time of maximum load has been reached in the sub-station, the generators will be working at their full capacity as three-phase alternators, and will be disconnected from the direct-current bus bars.

The efficiency of this method from the main station switchboard to sub-station switchboard is from 82 to 84 per cent, considering all stationary and rotary transformer losses and line losses.

It will be seen, too, that with these special generators we have the advantage of working them and their engines at full load all the time, and, therefore, at maximum efficiency; and we also have the additional important advantage of avoiding duplication in machinery and being enabled to use the same investment in machinery for the maximum load, both in the main station and sub-station, when the maximum loads do not coincide, which is the condition ordinarily met with in America.

In many of these sub-stations it may be found advantageous to operate series arc dynamos for municipal or commercial lighting in territory not covered by the Edison network, and in this case the rotary-current transformer becomes an exceedingly useful machine. The shaft of the rotary may be provided with a pulley and belted to a pair of arc dynamos in tandem, or to a line shaft, to which are belted the arc dynamos to be driven.

The rotary may then be used as a converter of alternating current to direct current, and at the same time as a motor driving the arc dynamos. In this way its capacity may be utilized advantageously and the machine operated at good efficiency.

The rotary-current transformer is exceedingly useful in developing new territory, since the machines are very small for their output, and a rotary sub-station will thus require only one-third the space of a steam station of the same capacity, and, moreover, the investment will be less.

Compared in point of economy of operation with a direct-current, tie-

line sub-station, or a storage battery sub station fed by a direct-current tie line, the rotary-current transformer sub-station is much more efficient and requires less investment for the same output when the average peak width of the sub-station is over three hours, as is the case in nearly all of our American stations.

We have seen that the efficiency of the various rotary transformer methods ranges from 74 to 85 per cent, and experience in the operation of storage battery sub-stations shows the watt loss through the battery itself to be 25 per cent. In addition to this we must consider the energy required to operate the booster for charging the battery, and also the loss of energy in the tie line between the stations. The labor required to operate the rotary-current transformer sub-station is very small, only dynamo tenders being required.

Compared with the ordinary steam station in the residence district, the economy of operation of the rotary transformer stations is very pronounced: two-thirds of the cost of fuel in the steam station, and all labor and supplies incident to the operation of the boilers and engines, may be saved, and during 16 or 18 hours each day the sub-station may be operated with only one man, and without any additional labor in the main station.

In connection with the rotary current transformers in the sub-station, storage batteries may be employed, if desired, to be used as auxiliaries in cases of emergency, but they will not increase the efficiency of the system.

Appreciating the value of broadening the load curve of their low-tension stations, a few of the companies have taken up contract arc lighting, both for commercial and municipal service, with the result that several of the residence stations which formerly had an average peak width of two to three hours, now enjoy a peak from five to seven hours in width. This tendency to widen the peak width lessens the value of the storage battery in residence stations, owing to its great cost, and increases the value of the rotary transformer method for sub-station work.

The real field for the storage battery as an economizer is in its employment in conjunction with the main steam-generating station, erected in the station itself when the latter is located in the electrical center of the district, and at the center of distribution when the main generating station is situated at a point distant from the electrical center of the territory to be supplied.

The rotary-current transformer methods, besides being more efficient in themselves, when compared with other systems, increase the economy of the main station by loading the units in that station in a manner similar to the storage battery.

The field for economy in the manufacture and distribution of electrical energy has not yet been exhausted, and there remains much that may be accomplished in electrical as well as steam engineering, but the best results can not always be obtained by adhering to old methods and barring from our doors the experience gained by those who have been thinking along different lines than ourselves.

We must acknowledge the good to be derived from the use of the alternating as well as the direct current, when properly applied, and we should so employ them that we may enjoy the benefit of the advantages of both without the disadvantages of either, and thus devise for ourselves a system of generation and distribution which will be more efficient and more flexible in operation than any method which lies within the reach of the alternating or direct current alone.

THE DISCUSSION.

In closing his paper, Mr. Ferguson noted that storage batteries might be used as auxiliaries, but would not increase the efficiency of the system. He held that the real field for the storage battery was in employment at the main station as an auxiliary in case of emergency, and at the center of distribution or sub-stations for the same purpose. He gave figures from current practice showing the comparative cost of a steam sub-station as against the rotary transformer sub-station.

The discussion was opened by Mr. R. R. Bowker, who said that his recent inquiries in Europe showed results confirming generally the position taken by Mr. Ferguson, but he pointed out that the investment already made in steam sub-stations was by no means rendered useless by the new method, as, so long as the lighting load was characterized by a high peak, the steam stations could be profitably operated to carry the peak portion of the load.

Mr. H. F. Parshall discussed English distribution systems for power and light, noting the high periodicity chosen in most of the English alternating distributions, and the large proportion which incandescent lighting formed of the total load in these systems. He did not see an advantage for lighting alone of changing the alternating current to direct current for distribution to consumer.

Mr. C. L. Edgar pointed out that the choice of either of the three generating arrangements described by Mr. Ferguson for any given case would depend upon the proportion of alternating current and direct current in the total demand of the consumers, so that the different choice of methods in Chicago and in Brooklyn had been controlled by local conditions.

Mr. W. S. Barstow described very fully the new Brooklyn generating station at Bay Ridge and the three-phase transmission at high pressure of alternating current and the transformation of the three-phase current by means of rotaries, and by synchronous motors driving arc dynamos into low tension direct current for distribution on the Edison three-wire system, and high-tension direct current for series arc lighting. The distance to one sub-station by the route now used is 12 miles and the service is perfect. A storage battery is placed in one station as a reserve.

Mr. S. Dana Greene pointed out in reply to Mr. Parshall that American city conditions differ from those of London and other English cities in there being an important demand for direct current for many services for which alternating current was not available. He discussed and described some details of rotary sub-stations, particularly the independent regulation of pressure at each station according to its own requirements.

Mr. J. W. Lieb emphasized the necessity for the distribution of direct current by instances from both European and American practices. He incidentally noted the superiority of direct-current arcs over alternating arcs; and he described a temporary transmission used by the New York Edison Company in which a two-phase motor supplied by high-tension currents drove a pair of low-tension direct-current dynamos, feeding into the Edison three-wire mains at a place where there was a large demand for current.

Mr. S. Insull stated that the Chicago Edison Company's experience had proved the advantage of concentration of generating plant. He remarked that the instances of sub-station distribution, which had been mentioned in the discussion, were all located in large cities, but that the principle was equally applicable to smaller stations and that many of these might, with advantage, be rearranged or extended in this way. He recommended the study of the method to all present, with a view to its possible application in their own cities.

Mr. R. R. Bowker summed up the discussion by saying that no distribution would fit the conditions of central station work to-day, unless it possessed the flexibility and the wide range of application which characterized the original three-wire system and that it seemed to be impossible to secure these in conjunction with long-distance transmission except by the use of rotaries; and Mr. Ferguson, in closing, adopted Mr. Bowker's expressions.

A Song of Gladness.

[*From Dixie.*]

The sombre days of doubt are gone and the glad sunshine of confidence fills the land and streams its cheering rays into all the places that have been dark and forlorn. The dismal voice of discontent has been drowned by the merry music of whirring factory wheels. The songs of happy harvesters come swelling up the valleys and o'er the hills until the souls of men are grateful and the world is filled with gladness.

The western sky is aglow with the reflection of golden harvests, and the fair Southland is drifted with snow-white fleece from her cotton fields. The East is noisy with the hum of industry; the dinner pail is in demand, and it is filled to overflowing. The firesides are happy and the nation is at peace. Glory to the men whose brave deeds redeemed our country! All praise to the patriots whose souls revolted against repudiation and dishonor. The prayers of a nation ascend in gratitude and thanksgiving. Long live the nation in peace and prosperity!

A Long-Distance Celebration.

On September 15 the Nebraska Telephone Company celebrated the opening of its recently completed long-distance lines by which Omaha is connected with the principal cities east of the Missouri River. Two largely attended receptions were held in the Telephone Building at Eighteenth and Douglas streets, Omaha, from 2 to 5 and 7.30 to 10.30 P. M.

Electric Light on the Whirlpool Rapids.

The lighting of the rapids by means of the electric headlights so impressed one observer as he saw the glancing scarlet flames apparently 100 feet or more in depth that he exclaimed, "It looks like h—l!" And it did, if that place of flames has the appearance of a river of boiling and many-colored fire.

The majority of electrical men who have been enjoying vacations by the sea, in the woods, and in Europe, have returned to their desks tanned and ready for work. The hopeful, cheerful feeling that now pervades the whole electrical industry is a happy augury.

TELEPHONE NEWS AND COMMENT.

The Marquette County, Mich., Telephone Company, which was organized two years ago, has about 1,000 telephones in operation in Ishpeming, Marquette and Negaunee.

The dividend rate of the American Bell Telephone Company has been at the rate of 15 per cent in 1897, 1896 and 1895, 16½ per cent in 1894, 18 per cent in 1893, and 15 per cent in 1892.

The Somerset County, Pa., Telephone Company are building a line from Somerset to Rockwood, and expect to have it done in a week or two. Other improvements to take place this Fall and next Summer is the extension of the line to Ursina, Confluence, Addison, Edie, Stoyestown and other parts of the county.

Three judgments, aggregating $10,017, were obtained last week against George H. Atkinson in favor of John A. Roebling's Sons Company on notes secured by bonds of the Home Telephone Company, of Trenton, N. J.; the Newark Telephone Company and the Best Telephone Manufacturing Company, for copper wire. Judgment for $1,054 was also entered against Cecil R. Atkinson, as indorser on a note of George H. Atkinson, in favor of the same plaintiffs.

The directors of the American Bell Telephone Company on September 15 declared a regular quarterly dividend of three per cent. The dividend is payable October 15 to stock of record September 30. Books will be closed October 1 to 14, both days inclusive. The dividend of three per cent makes 10½ per cent declared so far this year, three regular quarterly dividends of three per cent and one and one-half per cent extra declared in June, payable July 15. No action was taken by the directors regarding the sale of 1,500 shares of stock by auction.

Some time ago the Michigan Bell Telephone Company reduced the rental price of its telephones in residences to $24 per month, which was $1 a year less than is charged by the Detroit company. The rate for telephones in places of business still remained at $72. The company has decided to meet the rates of its competitor on downtown telephones as well, and announces that beginning October 1, next, the rate for office and store telephones will be $36 a year. This rate will apply to all telephones within the city limits. A new directory will be issued at the time the rates go into effect. A reduction will also be made in the company's toll rates for telephonic communication with towns in the vicinity of Detroit, from 25 cents to 10 cents. In all cases where 50 cents was formerly charged, the new rate will be 25 cents. The price of coupon message books will be reduced 25 per cent on all $50 and $100 purchases. W. L. Holmes, president of the Detroit company, says that this new move by its business rival will not affect the policy or plans of his company.

PERSONAL.

Nikola Tesla, after a severe illness of nearly three weeks, is rapidly improving in health.

Mr. Fred de Land, of Chicago, publisher of *Electrical Engineering*, visited New York city last week.

Mr. E. C. Wilcox, of the Connecticut Telephone and Electric Company, was a visitor in New York last week.

Mr. F. S. De Ronde, general sales agent of the Standard Paint Company, of New York, was in Chicago last week.

Mr. A. Edw. Newton, treasurer of the Cutter Electrical Manufacturing Company, Philadelphia, has been spending a few days in New York.

Mr. J. J. Carty, chief engineer of the New York Telephone Company, returned to his duties last week looking hale and hearty after a vacation of several weeks spent along the Maine coast.

Mr. W. R. Pinchard, who is well and favorably known to the electrical fraternity in Chicago especially, having been connected with the city trade for about eight years, recently accepted a position as city salesman for the Electric Appliance Company.

Mr. J. H. Vail, chief engineer of the Pennsylvania Heat, Light and Power Company, of Philadelphia, recently met with an accident which almost resulted fatally. While riding his bicycle, Mr. Vail was struck by a heavy ice wagon in Germantown, just outside of Philadelphia. Mr. Vail was knocked down, the team passed over him, and one of the heavy wheels crushed his right shoulder blade and severely bruised his back and arm.

Mr. George Flett, one of the directors of Dick, Kerr & Company, Limited, London, and his wife, are visiting this country inspecting street railway properties and manufacture, and attended the Street Railway Convention at Niagara Falls last week. In the party were Mr. Alfred Dickinson, of Birmingham, consulting engineer, and Messrs. William Rutherford and Bleeton, of Dick, Kerr & Company. They will remain a fortnight longer in this country.

Mr. H. F. Parshall and wife, of London, England, are stopping at the Waldorf. Mr. Parshall is a well known electrical engineer of the United States, who for three years past has resided in London, acting as consulting engineer for some very large traction interests. Mr. Parshall is accompanied by a party of street railway owners, including William M. Murphy, of Dublin, former M. P., and a director in a number of large tramway companies; Mr. William Anderson and son, Edgar, of Dublin, the former being secretary and manager of the United Tramways Company. It is intended to equip 40 miles of tramways in Dublin electrically, displacing horses. This entire party were interested visitors at the New York State Street Railway Convention at Niagara Falls last week, and were warmly welcomed by the street railway men present.

The General Electric Company at the Niagara Falls Convention.

The General Electric Company was well represented at the convention of Edison Electric Illuminating companies, as befitted its position in regard to them.

The members of the company in attendance were S. Dana Green, H. W. Darling, John Kreusi, C. T. Hughes, M. K. Eyre, A. D. Page, John W. Howell, C. D. Haskins, F. M. Kimbal, S. B. Paine, W. S. Andrews, W. J. Clark and John McGhie.

In one of the rooms of the Cataract House, directly behind the convention hall, the General Electric Company made an exhibit especially for the Edison people. Upon a switchboard were mounted examples of their incline coil instruments, the Edgewise instrument for feeder-board service, a large "G"-2 astatic ammeter for recording the total output of stations and calibrated to 2,000 amperes, a direct-current astatic ammeter. A sample of the new Thomson recording wattmeter, especially designed for use by Edison Electric Illuminating companies, was also shown, as well as a lamp inspector's indicating wattmeter.

Upon a table were laid samples of the new porcelain cut-outs developed by the General Electric Company, sections of its wires and cables, and examples of underground junction boxes and distribution boxes.

To explain the manufacture of type "H" transformer, there were shown the component parts of a transformer in the different states of manufacture.

The exhibit also comprised samples of the single solenoid arc lamp and of the lately developed and very successful alternating-current inclosed arc lamp.

The exhibit was completed by two one-horse-power motors, one for 500-volt and the other for 220-volt circuits. The room was hung with the diplomas which the company has taken at the different expositions and photographs of some of its more important works. A full supply of literature was provided for the use of the delegates.

For the Street Railway Association the company made no exhibit. It was represented by Mr. W. J. Clark, the manager of its railway department, and Mr. Ralf H. Beach, two of the best known and most popular men at the convention.

Bridge Trolley Plans Adopted.

The trustees of the New York and Brooklyn Bridge, at a special meeting held last week, approved the plans for a trolley terminal on the New York side of the bridge. The new scheme provides for a surface terminal instead of one above the street level, as at first proposed.

Buffalo Engine Works Assign.

A general assignment was made last week by the Buffalo Engine Works, of Buffalo, N. Y. Joseph E. Barnard, secretary, treasurer and bookkeeper of the company, was made assignee. No preferred creditors were mentioned.

The Lighting of the Gorge at Niagara Falls.

A very successful and beautiful trial demonstration of the lighting by electricity of the whirlpool rapids of Niagara Falls was given last week during the conventions in that city and greatly pleased every observer. Tuesday and Wednesday evenings special parties of ladies and gentlemen took the Gorge route cars, accompanied by a flat construction car carrying the searchlights and appliances. Current was taken from the trolley wire, six searchlights being supplied, and magnificent color effects were produced on the surging waters by means of the usual color screens. Mr. Luther Stieringer originated the scheme, and through the liberal assistance given by Capt. J. M. Brinker, president of the Gorge road, and Superintendent J. K. Brooks the work was carried to a most successful issue. The apparatus was furnished for the occasion through the courtesy of the General Electric Company. Further private trials are in progress to determine the proper arrangement and quantity of light required to illuminate these rapids in the most effective manner.

Numerous requests for the repetition of this novel lighting during the American Street Railway convention in October have been made, and, if possible, will be complied with.

The Military Telegraphers.

The seventeenth reunion of the United States Military Telegraph Corps was held on September 15 at the Maxwell House, Nashville, Tenn. In the absence of President Plum, of Chicago, who was unavoidably detained, the meeting was called to order by Vice-President W. B. Wilson, of Holmesburg, Pa. Mr. Whitford acted as secretary.

The executive committee announced that while a number of new members had been received during the year, applications of others had been refused as they did not come within the requirements of the association.

The election of officers, which was then taken up, resulted as follows: President, W. B. Wilson, Holmesburg, Pa.; vice-president, E. Rosewater, Omaha, Neb.; secretary and treasurer, J. E. Pettit, Chicago. The meeting then adjourned to meet at Omaha, Neb., the third Wednesday in September, 1898.

Boston Elevated Railway.

The Massachusetts State Railroad Commissioners last week approved the lease of the West End Street Railroad Company by the Boston Elevated Railway Company. The proceedings were formal. Chief engineer E. K. Turner, who was appointed by the board to examine the plans of the Boston Elevated Railway Company, has completed his work and will submit his report to the board on demand.

The telephone people of Staunton, Va., whose experience with pretty telephone girls has not been altogether satisfactory, advertised for ugly girls, and there were 25 applicants.

A Large Water-Power in Canada Sold to a Syndicate.

A press dispatch from Quebec states that the Shawinegan Falls water-power, which is said to be second only in extent and capacity to Niagara Falls, has been sold to David Russell, of St. John, N. B., for $50,100. The crown lands department requires that $2,000,000 shall be spent in 18 months in the erection of buildings and on the plant and development of water-power, and that the sum of $4,000,000 in all is to be expended within two and a half years for these and other improvements. It is understood that Mr. Russell represents a powerful Canadian-American syndicate said to be allied with the Canadian Calcium Carbide Company. It is reported that competent engineers have estimated the capacity of this water-power as equal to 500,000 horse-power.

Police Telegraph Superintendents.

The International Association of Fire and Police Telegraph Superintendents completed their convention at Nashville, Tenn., on September 15, and adjourned to meet next year in Elmira, N. Y., on the second Tuesday in September.

Officers were elected for the following year as follows: President, W. Y. Ellett, of Elmira, N. Y.; vice-president, Capt. Wm. Brophy, Boston; secretary, H. F. Blackwell, Brooklyn; financial secretary, Burt McAllister, Bradford, Pa.; treasurer, Adam Bosch, Newark, N. J. Executive committee, F. C. Mason, Brooklyn, chairman; Jno. Aydon, Wilmington, Del.; W. H. Thompson, Richmond, Va.; J. F. Zeluff, Paterson, N. J. J. E. Pearson, Des Moines, Iowa.

Death of George S. Hegeman.

The sudden death of Mr. George S. Hegeman, vice-president of the Hart & Hegeman Manufacturing Company, Hartford, Ct., occurred recently at Detroit of acute inflammation of the kidneys. Mr. Hegeman was on his way to Seattle, Wash., and had stopped off at Detroit to visit his sister, when he was attacked by his illness, which lasted but three days. Mr. Hegeman was a graduate of Yale and of the Columbia University Law School. He had been connected with the company of which he was vice-president since it was organized in 1890. Mr. Hegeman was 40 years of age and unmarried.

Edward P. Hampson & Company Assign.

Edward P. Hampson and William F. Haring (Edward P. Hampson & Company), contractors and sellers of machinery, engines and boilers at 36 Cortlandt street, New York city, made an assignment on September 17 to Albert N. Chambers, of Newburgh, N. Y., without preference. The liabilities are about $30,000.

Mr. J. H. Rhotehamel, of the Columbia Incandescent Lamp Company, St. Louis, visited New York city last week.

THE PRECISION OF ELECTRICAL ENGINEERING.

INAUGURAL ADDRESS OF THE PRESIDENT, AT THE 14TH GENERAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, ELIOT, ME., JULY 26, 1897, BY FRANCIS B. CROCKER.

(Concluded from page 130.)

The paper on "The Alternating Current Induction Motor," presented by vice-president Charles P. Steinmetz at this meeting of the institute, affords an excellent example of the marvelous precision of electrical engineering. In Figs. 1 and 2, two curves are shown, which give the efficiency, speed, power factor and other characteristics of a three-phase induction motor under various conditions. These curves were all predetermined by calculation. In the same figures the results obtained by actual test are also marked by small crosses. The agreement in all cases is so close that curves plotted from the actual results of tests would practically coincide with those predicted by calculation. This is all the more remarkable when it is remembered that the three-phase motor is one of the newest of electrical machines, and is a difficult problem from a theoretical standpoint. It has long been possible in designing direct-current machinery to predetermine the results with almost as great accuracy as that shown in the curves of Mr. Steinmetz; but, of course, that is a much older problem. Nevertheless, the predetermination of results in direct-current machinery is fully as difficult as in the case of alternating-current apparatus, because permeability is the most doubtful factor in such calculations, and is especially so at the high-flux densities used in the former. It is to be observed, however, that any error in the permeability data can be corrected by increasing or decreasing the ampere turns on the field magnet. This is easily accomplished by providing five or ten per cent greater magnetomotive force than the calculations require, which may be reduced, if necessary, by the introduction of resistance. Since the energy used for the field is a very small percentage of the total amount, it may be considerably varied without materially affecting the other factors in the machine. Sparking at the commutator brushes is an additional and by no means simple question which confronts the designer of direct current apparatus. I remember, however, being informed by Mr. Gano S. Dunn, several years ago, that he had found by experience in many cases that the efficiency of a direct-current dynamo or motor can be predetermined from the drawings before the machine is built, within a fraction of one per cent; in fact, he relied more upon his calculations than upon an actual test of the completed machine, even when performed by skilled men. In one case the calculated efficiency was 93 per cent, and the result obtained by test was 92.7 per cent, and in another case the total flux was found to be 1.38 per cent greater than the computed value. This agreement is somewhat closer than is found in every-day practice, but is not accidental and can usually be approximated by careful work.

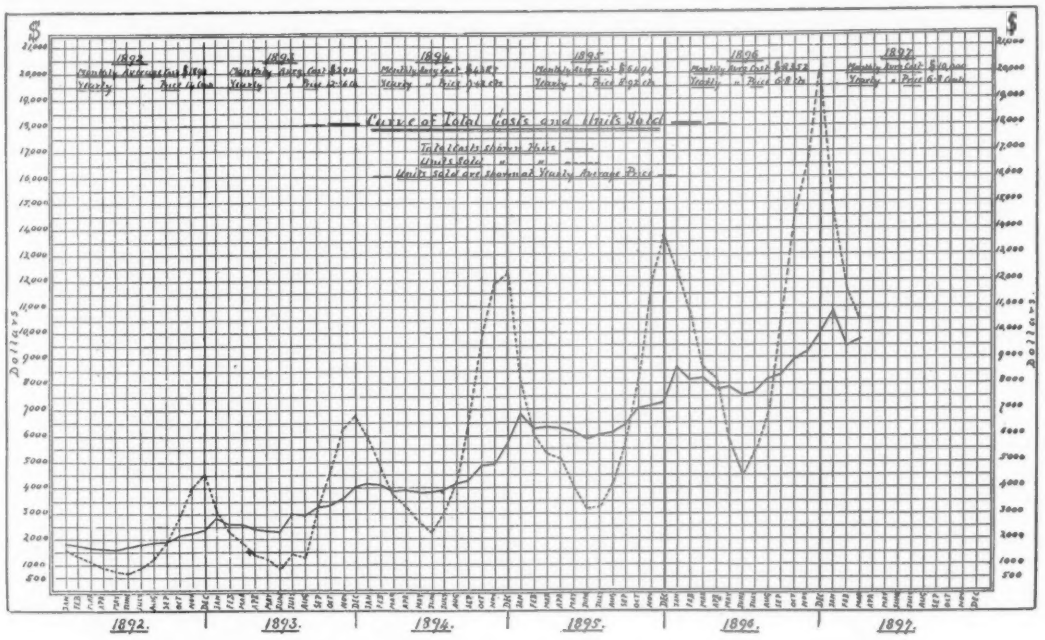

FIG. 1.—CURVE OF TOTAL COSTS AND UNITS SOLD AT THE BRIGHTON, ENG., STATION.

We naturally suppose ourselves to be familiar with mechanical energy and heat; but as soon as we convert these well known forms of energy into that extremely subtle and mysterious agent—electricity—it immediately becomes far more definite and convenient to control, measure, transmit and utilize. In becoming intangible, it forthwith acts as the most reliable and matter-of-fact tool in the hands of those familiar with it. For example, the quickest, neatest and most exact method of making a test of mechanical friction, or the power required in any given case, is by the use of an electric motor. In this way, for example, we can determine the friction of different bearings or lubricating oils under various conditions of pressure and speed, or the power consumed by fans, pumps and other machines.

Quite a striking example of the possibilities of electrical measurement is the determination of the electromotive force of a dynamo machine without running it, which I saw successfully carried out more than ten years ago. All that is necessary is to measure the torque exerted by the machine with a given current in its armature. This may be accomplished by simply clamping a stick of wood to the pulley and weighing the pull at a given radius by means of a spring balance. If the same machine were run as a dynamo and had no losses, it follows that

$$\frac{EI}{746} = \frac{2\pi rSP}{33{,}000},$$

whence

$$E = \frac{rSP}{7.04I},$$

in which r is the radius at which the pull is measured, S is the speed in revolutions per minute at which the dynamo is to be run, P is the pull in pounds at the given radius and C is the current in amperes. The field strength is supposed to remain the same. This method is correct whatever the efficiency of the machine may be. The electrical and magnetic losses due to the C^2R effect in armature, field current, eddy currents and hysteresis do not enter this problem. Even the mechanical losses arising from friction of bearings, brushes, etc., may be eliminated by measuring the pull plus the friction and then minus the friction, the actual pull being one-half the sum of these two results. The effect of friction may also be gotten rid of by tapping the shaft when the measurement is made. It certainly strikes one as strange that electromotive force, which depends upon cutting lines of force, can be determined while the machine is standing still.

In electro-chemistry and electro-metallurgy quantitative relations are particularly precise. The ampere being defined as the current which deposits .001118 grammes of silver per second, the weight of any other substance is by Faraday's laws proportional simply to its chemical equivalent. This definition eliminates any error in passing from the electrical to the chemical data, or vice versa. The volt is also defined electro-chemically in terms of the electromotive force of a Clark cell.

The author presented before the Institute in May, 1888, a paper on "The Possibilities and Limitations of Chemical Generators of Electricity,"* in which the weights of materials, electromotive force and other data were given for various voltaic combinations. Some of the figures were obtained by experiment and some by calculation. The paper also gives the electromotive force produced by combinations of 13 of the most important metals with chlorine, bromine and iodine respectively. The average difference between the calculated and tested values was less than one-tenth of a volt. Even this small error is practically eliminated when the results are corrected by the equation of Helmholtz, that is, by adding the quantity $\pm T\frac{dE}{dT}$, in which T is the absolute temperature and E is the electromotive force of the cell. Since the weights of materials liberated or consumed by a given current in a given time can be definitely predetermined and the voltage due to a certain chemical combination can also be accurately calculated, almost any problem in electro-chemistry or electro-metallurgy is susceptible of being quite easily and correctly solved.

That branch of electro-chemistry and metallurgy which employs electrical heating methods is also very definite, the exact amount of heat in gramme degrees produced by an electric current being always given by the simple expression, $.24\ I^2R$, or $.24\ EI$.

In support of the proposition advanced in the title of this address, I am able to produce most interesting personal testimony. Mr. Edison and

* Transactions, vol. v., p. 227.

TABLE II.—Comparative effects of the correct charges during the various years of development.

Date.	Year of operation.	Inclusive daily charge per K. W. hour consumed in one hour.	Inclusive daily charge per K. W. hour consumed in four hours.	Ratio charges bear per K. W. hour if consumed in one hour and four hours respectively.	Ratio of charge for first lamp hour to subsequent lamp hours (including lamp renewals).	Inclusive charge for supplying one 50-watt lamp one hour daily on average throughout the year.	Inclusive total charge for supplying one lamp for *four* hours daily(including lamp renewals).	Inclusive total charge for supplying one lamp for *ten* hours daily(including lamp renewals).	Equivalent cost of gas giving same C. P. with ordinary burners per 1,000 feet, according as the lamps are burned.			Annual cost of current for 500-watt arc lamp burning ten hours daily.	Inclusive annual cost of 500-watt arc lamp, with attendance and carbons, but exclusive of interest on lamp and post.	Correct charges for motors of 75% efficiency.	
									1 hour daily.	4 hours daily.	10 hours daily.			Annual charge per maximum B. H. P.	Cost of current per K. W. hour.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		cents.	cents.			cents.	cents.	cents.	$	$	$	$	$	$	cents.
1887	2	67.08	23.23	2.89	7.2	3.394	4.8	7.615	4.24	1 5	.95	264	307	214	8.6
1888	3	55.3	20.45	2 71	5.83	2.80	4.245	7.125	3.5	1.325	.89	245	286	170	9
1892	1	32.27	15.4	2.10	3.1	1.664	3.28	6.515	2.08	1 025	.818	219	262	82	9.7
1893	2	26.22	11.93	2.2	3.38	1.3505	2.5425	4.9825	1.67	.792	.615	165	208	69	7.17
1994	3	25.55	9.06	2.82	2.87	.9675	1.9725	3.9825	1.21	.613	.498	131	174	46	6
1895	4	18.93	8.7	2.18	3.25	.9865	1.8975	3.7225	1.235	.59	.465	121	164	50	5.28
1896	5	17.86	7.51	2.37	3.85	.983	1.6900	3.12	1.165	.505	.39	100	143	50	4

Mr. Tesla have independently expressed to me their opinion that electrical knowledge had become so definite and general that almost any one could apply it, and comparatively little opportunity was left for invention. They believed that chemistry and thermodynamics were far more uncertain and therefore offered a much better field for improvement. These views were expressed several years ago, and subsequent events have shown that they contain a great deal of truth. It is a fact that electrical engineering has advanced along the lines laid down by these and other great inventors, and it is also true that much of the work has been done by the rank and file of the profession. The trails blazed by the pioneers have since become broad highways with many branching roads, built for the most part by common workmen. On the other hand, the discovery of the Roentgen ray has since been made; and both of these investigators have given much valuable time to it. It would seem, therefore, that the electrical principles and laws of to-day are true for all time, and afford a firm foundation for unlimited future progress, but there are also many additional facts yet to be discovered that are well worthy of the efforts of the greatest genius.

In conclusion, the following quotation from the preface of Maxwell's great work on "Electricity and Magnetism" is appropriate. "The important applications of electromagnetism to telegraphy have also reacted on pure science by giving a commercial value to accurate electrical measurements, and by affording to electricians the use of apparatus on a scale which greatly transcends that of an ordinary laboratory. The consequences of this demand for electrical knowledge and of these experimental opportunities for acquiring it, have been already very great, both in stimulating the energies of advanced electricians and in diffusing among practical men a degree of accurate knowledge which is likely to conduce to the general scientific progress of the whole engineering profession."

These words were written in 1873, and yet they show strong confidence in the accuracy of electrical methods and full appreciation of the close relationship between electrical science and engineering, as well as their beneficial effects upon each other. At that time the telegraph was the only practical application of electricity. What language would express Maxwell's wonder if he were alive to-day!

A Fine Telephone Directory.

The ELECTRICAL REVIEW acknowledges receipt of the official Cincinnati telephone directory, published by the City and Suburban Telegraph Association, of which Capt. G. N. Stone is general manager. The directory is fresh from the bindery and was delivered to subscribers in Cincinnati last week. In addition to the names and number of each subscriber, it contains a complete schedule of long-distance rates from Cincinnati, Covington and Newport, and, besides, contains a feature that will undoubtedly prove of great popularity; namely, a numerical list of telephones, showing in the order of their numbers the page in the directory on which any number may be found. It sometimes happens that the telephone number is known and the name of the subscriber is not, and it is for just such emergencies as these that thoughtful Captain Stone has provided in his fine directory. A map of the long-distance territory covered by the American Telephone and Telegraph Company is included in the directory.

A Thmart Editor Who Would Not Thuccumb.

"We are thorry to thay," explained the editor of the Skedunk *Weekly News*, in a double-leaded article at the head of the first column of his editorial page, says the *Chicago Record*, "that our compothing room wath entered lath night by thome thcoundrel who thole every 'eth' in the ethtablithment and thucceeded in making hith ethcape undetected.

"It hath been impothible, of courthe, to procure a new thupply of etheth in time for thith iththue, and we are thuth compelled to go to preth in a thituation moth embarrathing and diththrething; but we can thee no other courthe to purthue than to make the beht thtagger we can to get along without the mitthing letter, and we therefore print the *Newth* on time regardleth of the lothth we have thuthtained."

The Inventor's Reward.

The following story, as told by the Springfield, Mass., *Republican*, shows how an inventor's talents are sometimes recognized: "A young man employed at $1.80 a day in one of the factories in New Britain, Ct., recently invented an attachment to a machine on which he was working, which promises to be of great value. Four men were employed on this machine prior to his invention, and its use was about to be abandoned because of the expense attending the running of it. The young man devised an attachment which, when applied to the machine, permitted one boy to attend it, and he can turn out as much work as the four men could previously. This machine is run regularly every day, and it is doing good work at a saving of $6 a day over former cost. The president of the company gave the young man a check for $25."

PROFITABLE EXTENSIONS OF ELECTRICITY SUPPLY STATIONS.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, NIAGARA FALLS, N. Y., JUNE, 1897, BY ARTHUR WRIGHT.

(Concluded from page 131.)

In the comparison of the cost of an electric lamp with that of gas, it has been assumed that the gas is of a quality known as 16 candles, which, burnt with ordinary burners, generally gives two candle-power per cubic foot.

In order to make the comparison, in Columns 8, 9 10 of Table II, between the charges for electricity and gas, applicable to other towns, it seems to the author fair to assume that the ratio of the cost of producing gas and electricity in any one town bears generally a constant ratio, as the items which affect this, such as the cost of capital, coal, labor, etc., would generally vary in similar proportions.

From Table II it will be seen that, even in the year 1893, when something under 300,000 kilowatt hours were sold, the charges for a 16-candle-power lamp, burning four hours a day throughout the year, would have been less than gas at 80 cents per 1,000 feet, and that last year, when the supply was under 1,500,000 kilowatt hours, electricity burnt under these circumstances could compete with gas at 50 cents; while for street lamps, or lamps used in basements all day long, electricity was cheaper than gas at $1 per 1,000 feet, in 1887, supplied from the small pioneering station.

Columns 11 and 12, of Table II, giving the charges for current and total inclusive cost for a 500-watt arc lamp, may be of interest, as also may be the proper tariff for motive power, shown in Columns 13 and 14 of the same table.

To illustrate how impossible it is for electricity to be supplied on a uniform tariff at so low a price to the lamps used in the average house of the middle classes as it can be profitably done on an equitable sliding scale, it is only necessary to note that to have produced the same amount of profit in 1896 the uniform charge per kilowatt hour would have been, to this four-hour class of consumer, 9.3 cents against the equivalent charge of 7.5 cents, or at an increased charge of 25 per cent.

If we take the case of saloons and clubs, which keep open late throughout the year, and burn, on the average, their lamps six hours a day, the necessary uniform charge would have been 46 per cent higher, and, in the case of basement users, using their lamps 10 hours a day, on the average, throughout the year, a uniform charge would have to have been 70 per cent dearer than it could have been supplied on the system of equal profits, whereas the one-hour consumer, on the uniform system, would have been charged 9.3 cents against the proper charge of 17.86 cents per kilowatt hour, and, as 15 cents would have been the actual cost to the supply station in giving him this kilowatt hour, the company would have lost no less than six cents for every kilowatt hour so sold.

It may be thought that the amount of the service rentals shown in Column 8, of Table I, to be equitable in the different years, may prevent the classes the author so strongly suggests should be catered for from being able to benefit in point of economy by a supply; but it is easy to show from the tables that even in the year 1894, with a sale of 583,701 kilowatt hours in any ordinary residence where at least four lamps are generally used till 10 P. M., any householder should have been able to get electricity cheaper than gas. Morever, directly cheaper forms of electricity meters are put on the market, and meter readings can be taken once a quarter instead of once a month, as hitherto, these service rentals will very much diminish.

In case any of the members should be inclined to think that there is no necessity to depart from the ordinary method of charging a uniform price per lamp hour, the author has prepared the curves showing how very slightly the total costs of a central supply company vary in the different months of the year, nothwithstanding the enormous variation in the number of kilowatt hours sold. These curves, in the author's opinion, are the most speaking condemnation any manager can possibly have of the commercial unsoundness of the uniform method of charging.

In order to demonstrate very clearly the effect of the gradual development of the business on an equitable sliding scale of charges, the author has prepared the curves showing how the varying charge per kilowatt hour, according to the number of hours the demand is used, has diminished in the various years, as many managers have suggested that this necessity for a high initial rate will disappear on electricity being more generally used.

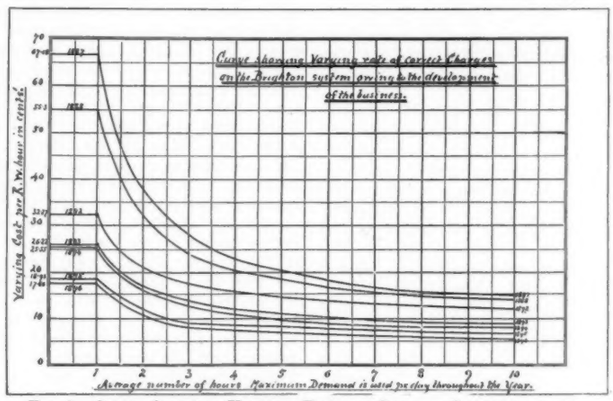
Curve showing Varying rate of correct Charges on the Brighton system owing to the development of the business.
Varying Cost per K.W. hour in cents.
Average number of hours Maximum Demand is said to be in use throughout the Year.

FIG. 2.—CURVE SHOWING VARYING RATE OF CORRECT CHARGES AT THE BRIGHTON, ENG., STATION.

TABLE IV.—Showing total investment and annual charges to revenue account.

Date.	Year of operation.	Capital sunk in undertaking at end of year.	Capital sunk in mains and services, exclusive of meters, etc.	Plant investment.	Total charges to revenue account, including service costs, and 5½% on capital.	Total annual service cost.	Total running costs for K. W. hours sold.	Ratio of standing-by charges to actual running costs of year.	Cost per mile of street for mains and services.	Cost of mains per service connected.	Plant investment per service.	Plant investment per K. W. of maximum demand on station.
		1	2	3	4	5	6	7	8	9	10	11
		$	$	$	$	$	$		$	$	$	$
1887	0	44,800	.....	.....	12,720	936	2,810	3.19	.....	....	....	....
1888	0	59,750	.....	.....	18,830	1,070	3,980	3.46	.....	....	....	....
1892	1	255,000	101,000	72,300	32,430	2,060	3,975	4.16	23,700	480	341	452
1893	2	375,000	175,500	89,400	35,000	3,240	4,765	5.67	19,500	419	213	312
1894	3	574,000	266,000	132,500	51,200	4,630	10,650	3.38	15,200	312	155	262
1895	4	728,000	326,500	165,200	79,250	8,250	13,330	4.25	16,600	306	155	210
1896	5	857,500	384,000	194,000	99,000	9,350	16,800	4.34	17,500	281	142	196

NEW YORK STREET RAILWAY MEN.

(*Continued from page 131.*)

J. H. McCormack, general superintendent Brooklyn Heights Railway Co., Brooklyn, N. Y.
John W. McNamara, Albany Railway Co., International.
Henry S. Newton, Syracuse Rapid Transit Railway Co., Syracuse, N. Y.
Edmund O'Connor, attorney of association, Binghamton, N. Y.
B. W. Porter, Saratoga Traction Co., No. 99 Cedar street, N. Y.
Alex J. Porter, director, N. F. & S. Railroad, Niagara Falls, N. Y.
T. C. Penington, secretary American Street Railway Association, No. 2020 State street, Chicago, Ill.
G. T. Rogers, president Binghamton Railroad Co., Binghamton, N. Y.
Geo. H. Sliney, Nassau Railroad Co., Brooklyn, N. Y.
Chas. H. Smith, superintendent Troy City Railway, Troy, N. Y.
C. B. Story, Hoosick Railway Co., Hoosick Falls, N. Y.
E. F. Seizas, Amsterdam Street Railway Co., Amsterdam, N. Y.
Burt Van Horn, Niagara Falls & Buffalo Railway, Niagara Falls, N. Y.
Thomas H. Fearey, president Canandaigua Electric Railroad Co., Canandaigua, N. Y.
W. W. Wheatly, secretary Brooklyn Heights Railroad Co., Brooklyn, N. Y.
Henry M. Watson, president Buffalo Railway Co., Buffalo, N. Y.

REPRESENTATIVES OF MANUFACTURING INTERESTS.

Giles S. Allison, St. Louis Register Co., No. 18 Broadway, New York.
A. E. Aeby, The Pennsylvania Steel Co., No. 2 Wall street, New York.
H. E. Adams, Central Electric Co., Chicago, Ill.
R. H. Beach, General Electric Co., No. 44 Broad street, New York.
Wm. J. Clark, General Electric Co., New York, N. Y.
H. C. Evans, The Johnson Co., New York, N. Y.
Thomas H. Fearey, General Electric Co., Buffalo, N. Y.
J. A. Granger, New York Car Wheel Works, New York
G. W. Haskell, J. G. Brill Co., Philadelphia, Pa.
Percy Holbrook, Webb Joint Manufacturing Co., Cotton Exchange, New York.
Geo. J Jackson, secretary National Conduit and Cable Co., New York, N. Y.
E. J. Lawless, American Car Co., No. 115 Broadway, New York.
Elmer P. Morris, McGuire Manufacturing Co., No. 15 Cortlandt street, New York.
Frank MacGovern, Rossiter, MacGovern & Co., New York.
Frank A. Morrell, Sterling Supply and Manufacturing Co., New York.
Geo. T. Manson, the Okonite Co., New York.
D. W. Pugh, Poem, Stephenson Co., New York.
R. K. Polk, Wm. Wharton, Jr., & Co., Manufacturing Philadelphia, Pa.
H. N. Ransom, Consolidated Car Heating Co., Albany, N. Y.
Franklin Sheble, Edison-Brown Rail Bond, Philadelphia, Pa.
G. W. Swan, John A. Roebling's Sons Co., New York, N. Y.
Wm. H. Ten Broeck, Diamond Truck and Car Gear Co., Kingston, N. Y.
A. C Vosburgh, the New Process Rawhide Co., Syracuse, N Y.
C. R. Vincent, vice-president the Ball-Wood Co., New York.
C. N. Walsh, McIntosh, Seymour & Co., New York, N. Y.
H. D. Watson, The Edw. P. Allis Co., Milwaukee, Wis.
D. F. Potter, General Electric Co., Buffalo, N. Y.
J. McGhie, General Electric Co., New York.
Edgar P. Anderson, Dublin United Tramways Co., Dublin, Ire.
S. Beetson, Dick Ress & Co., Hove, Sussex, Eng.
Wm. Anderson, secretary and manager Dublin United Tramways Co., Dublin, Ire.
Frank M. Baker, railroad commissioner, Owego, N. Y.
Ashley W. Cole, New York State railway commission, Albany, N. Y.
Geo. W. Dunn, railroad commissioner, Binghamton, N. Y.
J. B. Concanon, Dublin, Southampton, Barcelona & Tramway Union Co., London, Eng.
Alfred Dickinson, European Tramways, Birmingham, Eng.
George Flett, managing director, Dick Kerr & Co., London.
J. F. Murphy, Dublin Tramways, Dublin, Ire.
Wm. Martin Murphy, Dublin & Belfast Tramway, Dublin, Ire.
Peter C. Deming, superintendent Buffalo Railway Co., Buffalo, N. Y.
T. Stoddard Beattie, *The Municipal Record and Advertiser*, New York, N. Y.
T. J. Nicholl, Rochester Railway, Rochester, N.Y.
John A. Read, Tonawanda Railroad Co., North Tonawanda, N. Y.
F. A. Esteh, president R. D. Nuttall Co., Allegheny, Pa
Edward P. Sharp, manufacturer's agent, Buffalo, N. Y.
Pemberton Smith, New York Car Wheel Works, Buffalo, N. Y.
H. L. Shippy, John A. Roebling's Sons Co., New York.
E. B. Waite, Tonawanda Railroad Co., North Tonawanda.
Charles N. Wood, R. D. Nuttall Co., No. 31 State street, Boston, Mass.
W. Phillips, Niagara Falls Park & River Railway, Niagara Falls, Ont.
Ames Van Etten, Kingston City Railroad Co., Rondout, N. Y.
C. R. Barnes, Inspector State Railroad Commission, Rochester, N. Y.
Frank A. Estep, president and treasurer, R. D. Nuttall Co., Allegheny, Pa.
F. C. Randall, Christensen Engineering Co., Hartford, Ct.
A. C. Vosburgh, secretary and treasurer, The New Process Rawhide Co., Syracuse, N. Y.
E. Peckham, president Peckham Truck Co., and E. G. Long.

THE PRESS WAS REPRESENTED AS FOLLOWS:

ELECTRICAL REVIEW, Charles W. Price; *Electricity*, Charles D. Shain; *Electrical Engineer*, T. C. Martin; *Electrical World*, L. H. Parker; *Street Railway Journal*, James H McGraw, W. H. Taylor; *Western Electrician*, J. B. O'Hara; *Stenographer*, T. E. Crossman; *Street Railway Review*, F. S. Kenfield.

The president's address was received with much applause.

Secretary Robinson then read the report of the executive committee, and Mr. Clark moved that the report be received, approved and spread upon the minutes.

The report of the treasurer was then read, and showed the financial transactions of the year to be as follows:

Receipts	$7,687 62
Expenses	6,326 24
Balance	$1,361 38

Report was accepted.

The President: The next order of business is the reading and discussion of papers. I will state that a delegation of prominent tramway men is here from abroad, and, in behalf of the association, I extend to them a hearty welcome, and also invite them to enter into our discussions, and perhaps we can get some light from the other side.

"How Can We Increase the Efficiency of Employés?" was read by Mr. W. W. Wheatley, of Brooklyn, N. Y.

Mr. J. B. Cahoon: I agree most heartily with all that Mr. Wheatley has said, but I do not think he has carried the matter far enough—not as far as we have carried it on our road in Elmira. We not only go into the subject of a thorough examination of the man as to his personal character and habits, etc., but, as far as possible, have conformed to the law of the State, and placed him in the power-house and given him a thorough training there, and followed that up with a course in the machine shop and car house and endeavored in that way and through careful training on the cars to put him in a position to understand what his duties are. We have also taken up the social side of the life of the conductors and mortormen and established a club-room for them, with the daily papers, electrical papers, prominent magazines and various games and things to amuse them when off duty.

The President: Will Mr. Murphy or one of our friends from across the water tell us what they do there?

Mr. Murphy: As a tramway manager for 20 years, I have had some experience in this line, and fully approve the sentiments expressed in the paper which has been read; in fact, it is quite in accordance with my own views. We have a rather different class of people in Dublin from what you have in this country; the men are apt to keep their positions longer. We have many men in our company who have been with us a great many years, and a service stripe for 10 or 15 years would be quite common. We look after the comfort of the men as far as we possibly can, and increase our efforts each year. We have a road 45 miles long with 1,600 horses. We are about to adopt the electric system, and it is with that object in view that the committee has come over here, consisting of two directors and myself.

The President: The next paper will be "A Decade of Electric Railroad Development," by Mr. W. J. Clark, of New York.

Mr. Clark read the paper, which was received with great applause.

On motion the meeting adjourned until 2.30 o'clock.

TUESDAY AFTERNOON'S SESSION.

The president called the meeting to order at 2.45, and the first paper read was by Mr. Caryl D. Haskins, of Boston—the "Economical Influence of Accurate Measurements."

Mr. Cahoon: There is a factor in this question which interests us all, and that is, how much does the meter cost?

Mr. Haskins: The 25 amperes, 500 volts, is $40; the 50 amperes, 500 volts, is $50, with a discount of 50 per cent.

The President: Where have these meters been adopted?

Mr. Haskins: The meter has not yet been adopted by any road. It has not yet been offered on the market. It has just gone through its final test in our hands. It has been running on the Lynn & Boston road over the roughest section of their line.

The President: The next paper is on "The Advantages of a Car Mileage Record," by T. J. Nicholl, of Rochester.

Mr. Nicholl: Mr. President and gentlemen of the convention, I have a paper here which was prepared by our mileage clerk, Mr. Charles J. Ingalls, and any credit which may attach to the paper is certainly due to him. Mr. Nicholl then read the paper.

The President: I am sure the members will have something to say on this subject of car mileage.

Mr. Cole: My system is similar in detail to the one which Mr. Nicholl describes; the motorman turns in a report which is taken off by the starter, and in all its details it is similar to the Rochester system.

The President: The next paper is "Facts and Fancies of Railroads," by Mr. W. W. Cole, of Elmira.

Mr. Cole: In the preparation of my paper I have been guided, to a great extent, by the nature of articles which have appeared in the public press. The public are being educated in the belief that the nickels taken in by street railroads are by some miraculous process being turned to gold and the gold is used in the corruption of public men. Such assertions are an obstruction to the liberal policy of a street railroad and hinder its good service; and, at the same time, it is an insult to public men. I believe public officials and railroad men should educate the people as to the facts and dissolve the fancies. Mr. Cole then read the paper.

The President: The next paper on the list is by Mr. H. S. Newton, of Syracuse—"Tract Bonding: How Can We Obtain the Best Results?" Mr. Newton read the paper.

Mr. McNamara: I ask the writer of the paper the method of placing the bonds in position which he uses; whether an attempt could be made to get six times the conductivity of the area of the bond wire?

Mr. Newton: We get nearly ten times.

Mr. McNamara: In what manner?

Mr. Newton: The contact between the bonds and the rail is made through a plate at the terminal at each end of the bond which is so designed as to have about ten times the surface of the cross-section of the wire itself.

Mr. McNamara: How do you distribute it from the wire?

Mr. Newton: The bond has six times the area of the cross-section of the copper conductor and comes in contact with an equal surface of the rail.

Mr. McNamara: How do you secure that, with 0000 wire?

Mr. Newton: It has contact terminals cast on the ends of the wire which are soldered to the web of the rail.

Mr. McNamara: Do you do that by increasing the diameter of the terminal, or spreading out the copper in some way?

Mr. Newton: There is a bond terminal cast on the copper.

Mr. McNamara: What is the diameter of that?

Mr. Newton: It is about two and a quarter inches diameter?

Mr. McNamara: I am much interested in this paper, as in anything that Mr. Newton undertakes to discuss. I am sure there is no one thing that street railroad men need give more attention to at this time than the perfect bonding of the tracks, not only for economy and operation—that is, to utilize all the power generated at the station—but to get rid of what I feel is coming one of these days: large claims for damages by reason of electrolytic action. If a majority of the people of the State of New York decide they are going to own the street railroads of the State, what are you going to do about it? Are you going to revolt? There are not enough of us. A large number of the people of the State of New York are determined that it is economy and good for the people to own all the street railroads, telephone and telegraph companies. I want to call attention to a paper in this month's *Street Railway Journal* by Mr. Edward E. Higgins, a very thoughtful paper on this subject of municipal ownership. I understand he is discussing the subject with Mr. Warner, of New York. He takes a stand in favor of municipal ownership. I commend this paper to every member of this association as a thoughtful and able paper on the subject, and, while I differ entirely from the conclusions and the remedies which Mr. Higgins suggests, I am very much indebted to him, and I am sure every member of the association would be if he read the paper. Mr. Higgins has adduced some valuable facts, and has stated them in a very plausible manner, in comparing the service in Glasgow with that given in Brooklyn and Boston, two cities of equal population but of much greater area.

The President: The reason I did not ask for discussion on Mr. Cole's paper is that we have another paper to be read by Mr. Vreeland on the same subject of municipal ownership, and it was my idea to discuss them both at the same time.

Mr. Cole: I would say that I think the public should be educated by our public men to understand that every time a law is passed which is beneficial in a measure to a railway, that it is also a benefit to the people, because the railway is enabled to give better service. The newspapers should not howl bribery, etc., because the laws sometimes give a benefit to the railroad. A railroad company does business on the same principle as a merchant. They have something to sell; they sell rides on their cars. The more attractive they can put the ride on the market, the more rides they will sell. The mere fact that the public patronizes roads in such large numbers shows that they appreciate these efforts, and they should be educated to appreciate that laws passed for the benefit of service railroads are also for the benefit of the people at the same time.

The President: The paper by Mr. C. L. Rossiter, of Brooklyn, "Advantages of Up-to-Date Street Railroad Service; Why the Rate of Fares Should Not Be Reduced," is next on the programme.

The secretary read Mr. Rossiter's paper.

Mr. J. P. E. Clark read the paper by Mr. Rubert Dunning, of Buffalo, on "The Repair Shop."

On motion, adjourned.

A brief meeting was held on Wednesday morning, at which no business was transacted, and the meeting adjourned, so that the delegates might take the trip to Lewiston, etc.

At three o'clock in the afternoon the meeting reconvened.

President Rogers: I appoint as the nominating committee Messrs. Moffitt, Robinson and McCormack.

The paper by Mr. H. H. Vreeland on "Municipal Ownership" was then read.

The President: We could discuss this paper for the balance of the afternoon, and I wish we might have some discussion upon it; but as it seems to

be the desire of the members to proceed with the reading of the papers we will proceed to the next.

Mr. H. S. Cooper then read a paper on "The Prevention of Accidents; The Best Method to Accomplish this End."

Mr. J. P. E. Clark: Owing to the lateness of the hour and the amount of business to be transacted, I move that the remaining papers be read by title, and I believe, under the circumstances, the gentlemen who prepared them will not be affronted. The motion was carried. The papers referred to are "Low Joints—How to Prevent Them," by C. L. L. Allen, of Syracuse; "Street Car Wheels—Should They Be Made Heavier?" by F. D. Russell, Rochester; "Construction and Maintenance of Car Bodies and Trucks," Robert Dunning, Buffalo.

Mr. J. P. E. Clark: I move that a committee of five be appointed to confer with the railroad commissioners of the State for the purpose of framing a set of standard or uniform rules to govern the operation of street railroads of our State. The committee should be selected from the larger and representative roads of the State, and be appointed after careful consideration, as I believe this is an important matter for the street railroads and the public of the State.

Mr. A. L. Johnson, Brooklyn: I believe this is the most important matter which has come before the meeting. I believe that the framing of just such rules will do more to prevent accidents than anything else. The greatest preventive of accidents is that the men who run the railroads should do the thinking for the employés. We run 150 miles of road. At every bicycle street we have a "stop" sign that means stop, not slow up. At 140 different places we have "slow" signs where children congregate on the street. All cars must keep 200 feet from the one ahead. There are five dangerous curves, and 200 feet ahead of the curve there is a circuit-breaker, and the lights instantly go down. It takes the action of both motorman and conductor to proceed over the curve, as the latter must change the trolley to the live wire and give the usual two bells. At all street railroad crossings we stop the cars. At steam railroad crossings our men go across the track and signal the car, as we do not rely upon the flagmen. I do not believe it is always desirable to educate your men and keep them for a long time. The most dangerous accidents we have are with old men, and not with new ones. It is the would-be expert who often gets into difficulties, especially in colliding with other vehicles in taking too many risks. We accept no excuse for a car running into a vehicle ahead of it if the brakes are in good order.

Mr. McNamara: I think the remarks of the last speaker demonstrate that this committee should be composed of men from the great cities, especially the Greater New York. They have collisions and other difficulties there which do not occur in other places. I think what would be safe for New York would be safe for Buffalo, Rochester and Albany.

Mr. Clark's motion was put and carried.

The President: I will appoint Messrs. H. H. Vreeland, of New York; C. L. Rossiter and A. L. Johnson, of Brooklyn; H. H. Littell, of Buffalo, and J. W. McNamara, of Albany.

A telegram from Mr. C. L. Rossiter, president of the Brooklyn Heights Railroad Company, inviting the association to hold its next meeting in that city, was read.

Mr. Johnson seconded the invitation, and assured the association of a hearty welcome.

On motion, the invitation was accepted.

Mr. J. P. E. Clark: The Street Railway Association of the State of New York has two important functions—the protection of the rights of its members, and the holding of the annual convention. I believe the annual meeting is an important matter; the interchange of ideas is of great practical importance. I arose simply to say that the business of the meeting should not be made subservient to the entertainment. We appreciate the good time we have had, but the royal entertainment we have received has overwhelmed the business, and we have not been able to properly discuss the papers presented. I desire to suggest that, in conducting the next annual meeting and subsequent conventions, the business of the convention be concluded before the question of pleasure is considered. (Applause.)

Mr. McNamara: I move that a vote of thanks be extended to the Buffalo & Niagara Falls Electric Railway, the Niagara Falls & Lewiston Railroad, the Niagara Falls & Suspension Bridge Railway, the Lewiston & Youngstown Frontier Railway, the Niagara Falls Park & River Railroad, the Niagara Falls & Clifton Suspension Bridge Company, the Niagara River Navigation Company, the Cataract Construction Company, the Niagara Falls Hydraulic Power and Manufacturing Company, the International Hotel Company and the local committees of arrangement and reception for their courtesies and the arrangements which they made for the entertainment of the delegates and others at the meeting. Carried.

Mr. B. W. Porter, secretary of the Connecticut Street Railway Association, requested that the members of that association be invited to attend the conventions of the New York association.

On motion of Mr. McNamara, the secretary was instructed to issue invitations in accordance with the request.

On motion, adjourned.

Tuesday night a fine banquet was held at the International Hotel. The following were the toasts:

Toastmaster—Hon. W. Caryl Ely.

Welcome—Hon. Arthur C. Hastings.

"The Empire State"—Hon. James M. E. O'Grady.

"The Niagara of To-day"—Hon. Thomas V. Welch.

"Street Railroads from the Consumers' Standpoint"—John Kendrick Bangs.

"Our Hosts"—Hon. Edmund O'Connor.

"The Railroad Commissioners"—Ashley W. Cole.

"Our Transatlantic Visitors"—William Murphy, Mr. J. B. Concannon.

"The Association"—John W. McNamara.

"The Railway Press"—J. H. McGraw.

"The Ladies"—J. H. Stedman.

"The Supply Men of To-day"—W. J. Clark.

John M. Brinker, Esq., was also called upon to make remarks.

WEDNESDAY.

The following officers were elected at the Wednesday meeting, and Brooklyn decided on as the next meeting place:

OFFICERS, 1897–98.

President: G. Tracy Rogers, president Binghamton Railroad Company, Binghamton.

First vice-president: W. Caryl Ely, president Niagara Falls Electric Railway Company, Niagara Falls, N. Y.

Second vice-president: J. T. Nicholl, vice-president Rochester Railway Company, Rochester, N. Y.

Secretary and treasurer: Henry A. Robinson, vice-president Metropolitan Street Railway Company, New York.

Executive committee: President, secretary and Herbert H. Vreeland, president Metropolitan Street Railway Company, New York; John W. McNamara, treasurer and general manager The Albany Railway, Albany; Henry M. Watson, president Buffalo Railway Company, Buffalo; Clinton L. Rossiter, president Brooklyn Heights Railway Company, Brooklyn, N. Y.

Street Railway Convention Notes.

Prof. S. H. Short and Messrs. Harding and Cook were present in the interest of the Walker company.

Tally-ho rides were very popular and were participated in by the ladies during both the charming days of the convention.

The Central Electric Company had quite an elaborate sample-board exhibit that was ably presided over by Agent Adams, of Buffalo.

President G. T. Rogers, of Binghamton, was unanimously re-elected, and is a fine presiding officer and a zealous and hard-working official.

Mr. F. MacGovern, of New York, was present in behalf of Rossiter, MacGovern & Co., the electrical dealers, of this city. His friends are many in the street railway field.

Mr. George T. Manson ably represented the Okonite Company, and introduced the street railway men to some new insulation at Lewiston, so as to equip them for the Gorge trip.

Major H. C. Evans and Mr. J. H. Rutherford ably represented the large interests of the Johnson company. Major Evans is a fixed and popular fact at all important gatherings of street railway men.

The Railroad Commissioners of the State were present. Col. Ashley W. Cole and Secretary Charles De Freest were in popular evidence, as was also Senator O'Connor, attorney for the Street Railway Association.

President Ely and general manager Van Horn, of the Niagara Falls & Buffalo line, extended every courtesy to both the street railway and Edison visitors. So did the genial Captain Brinker, president of the Gorge route.

Agent Ten Broeck represented the Diamond Truck and Car Gear Company, of Kingston, and gave away a convenient note book souvenier. The Diamond double truck conveyed the visitors to Buffalo on the new electric line, and the improved No. 5 truck is in regular use on the Niagara Falls & Suspension Bridge line.

Mr. F. C. Randall, of Hartford, Ct., enterprisingly represented the Christensen air brake. Mr. Randall's wide acquaintance in the street railway field gave him a particular advantage in securing listeners to his discourses on the good qualities of his street car brake. A number of attractive catalogues were distributed.

The International Hotel complimented the street railway visitors with beautiful badges, and as it became known that these were good for passage to Toronto and over all street car lines entering the city, their value rapidly increased. The visitors greatly appreciated this courtesy on the part of the International.

Secretary Charles R. Vincent, of the Ball & Wood Engine Company, New York, was another gentleman who impartially attended both conventions, and found friends in numbers to greet him at each hotel. He had the privilege of representing a company, the excellence of whose product did not require announcement in either the lighting or traction fields, for its modern work is known all over the United States.

Mr. E. Peckham, the well known head and front of the Peckham Motor Truck and Wheel Company, and Mr. E. G. Long were present in the interest of their universally successful truck. A beautiful nickel-plated model, with illustrated descriptive matter, occupied a center table in the hotel lobby. The Peckham company is one that never stands still, and new and valued improvements, suited to the new demands, are constantly being made.

Edison Convention Notes.

Mr. Luther Stieringer was made sergeant-at-arms and bore his honors with blushing modesty.

Mr. Edison was unable to be present, but sent his regards to all the men engaged in "selling juice."

The convention buttons were particularly neat and contained a picture of Edison. They were distributed by Mr. Kruesi.

W. A. Stadelman, of New York, arrived late, with Mr. Tallman, of Pittsburgh. They were soon even, however, with the early arrivals.

The General Incandescent Arc Light Company, of New York, had a small and attractive exhibit in Parlor F, of the Cataract House.

The Cataract House printed in its menus an excellent likeness taken from the REVIEW's pages of Thomas A. Edison. The menus became mementos.

Mr. S. Dana Greene, of the General Electric Company, was constantly greeting old friends in the Edison gathering. Mr. B. E. Sunny, of Chicago, was another welcome visitor, arriving on Wednesday from the West.

Secretary H. L. Shippy and General Agent Gideon Swan represented very thoroughly the J. A. Roebling's Sons Company and impartially divided their time and presence between the Edison and Street Railway Conventions.

Mr. Elmer P. Morris, of New York, gave quite an exhibit in double parlors, including Keystone instruments, Monarch insulating paint, Hemingray insulators, etc. The new Keystone arc light ground detector greatly interested the wide-awake electric light men.

Former President J. S. Humbird, of Pittsburgh, was greeted by old friends on all sides. Mrs. Humbird accompanied him. Mr. Humbird is now at the head of the Washington Carbon Company, and with Secretary Crider is securing a magnificent carbon business.

Mr. Charles R. Huntley and Mr. George Urban came over from Buffalo Tuesday afternoon and spent about a week's time before returning the same evening. Since Huntley and President McKinley together drove the first stake for the Pan-American Exposition, both still speak to old friends as ever before.

Mr. George J. Jackson, of the National Conduit and Cable Company, presided at a dinner table at the Cataract House, where were seated Dr. Wm. M. Habirshaw, H. L. Shippy, Chas. R. Huntley, Attorney Beals, George Urban, Samuel Insull and one modest man. The occasion was very happy and the Buffaloites just managed to catch the last train home.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

NORTHVILLE, N. Y.—The telephone line between this place and Batchellerville is nearly completed.

ROCHESTER, N. Y.—A. R. Wetmore, of North Cohocton, has built a telephone line between that place and Atlanta, and Hatch, Otto & Company will build a line from Atlanta to Wayland. L. H. Barnum has the contract.

ERIE, PA.—The new telephone line from this place to Union City has been completed as far as Waterford.

ELMWOOD, ILL.—The Elmwood Telephone Company has been incorporated. Incorporators: Marshall T. Lott, E. Gabriel, T. J. Morton, John Clinch and E. H. Dillon.

BALTIMORE, MD.—A syndicate, composed of five Philadelphia capitalists, two of whom are connected with the Pennsylvania Railroad Company, is negotiating for the purchase of the Home Telephone Company, of Baltimore.

RICHMOND, VA.—The Long-Distance Telephone Company has leased the large room at No. 1004 Hull street, to be used for their Manchester exchange.

STATESVILLE, N. C.—The telephone line to Bradford's and Yount's stores in Shiloh township has been completed.

SCOTLAND NECK, N. C.—Mr. S. K. Fountain, of Rocky Mount, will establish a telephone exchange in this city.

CUMBERLAND, MD.—The Chesapeake & Potomac Telephone Company expects to have its line completed to this place by November next, when telephone communication can be had between Cumberland and Washington and Baltimore via Hagerstown.

SCHOOLCRAFT, MICH.—The Bell Telephone Company is putting in metallic circuit 'phones in this village, and will have a long-distance station.

MILWAUKEE, WIS.—The American Telephone Company, which has its line completed through to St. Paul, will build a branch line from Tomah to La Crosse if the Common Council of La Crosse will grant a franchise. The branch line is completed to Sparta.

ST. DENIS, MD.—Permission was granted to W. R. Eareckson, M. D., and Arthur Williams, M. D., to construct a telephone line from this place through Catonsville avenue to Elkridge.

PORT HURON, MICH.—The New State Line Telephone Company's trunk line has been completed between this place and Detroit.

CHARLESTON, S. C.—A telephone line is being put up between Johnston and Saluda, C. H. This will give a connection to Edgefield and Augusta.

DURAND, WIS.—O. G. Potter, W. L. Murray and A. B. Lenhart, of Pepin, have effected the organization of the Pepin Telephone Company. They have just completed their line from Pepin to Stockholm and now have a through line from Durand to Stockholm. The company proposes placing telephones at Ella, Plum Creek and other points, and also hopes to reach Lake City, Minn. The line comes in contact with the Union Telephone Line Company at Stockholm, making a connection with all points in Pierce County stations.

ATHENS, TENN.—The Decatur & Athens telephone line has been completed and the first message passed. The line extends from Athens to Decatur *via* Riceville, Vigor and Fiketon. It was built entirely by local capitalists.

UNION, ORE.—The Union Telephone Company has completed its line from this city to the new town of Richland, in Eagle valley, and the line is now in working order to that point. The eastern extension will be finished to Cornucopia in about two weeks.

ANN ARBOR, MICH.—The New State Telephone Company will soon begin active work here.

Electric Light and Power.

GREENVILLE, S. C.—Lawrence & Company will probably purchase the electric light plant.

ATHENS, ALA.—The Mayor may be addressed concerning the erection of an electric light plant, to be run in connection with the city waterworks.

ATLANTA, GA.—An electric light plant will probably be established in this city.

FERNANDINA, FLA.—The site of the present electric light plant will be removed and the plant enlarged by putting in new machinery.

MURRAY, KY.—The Woodruff Lumber Company, L. Y. Woodruff, general manager, will put in an electric light plant to furnish the city with light. Will want dynamos and other electrical machinery.

CUMBERLAND, MD.—Plans are being prepared for the electric light plant in this city.

HUNTINGDON, TENN.—J. F. Leach, chairman committee, may be addressed concerning construction of waterworks and electric light plant.

TERRELL, TEX.—The Terrell Electric Light and Power Company will at once rebuild its plant. They are in the market for two 750-light compound alternative dynamos, one 30-light Wood arc machine, 1,200 candle-power, or 1,500-light compound alternative.

MONTGOMERY, W. VA.—The Montgomery Electric Light and Power Company has been incorporated by Alexander McNab, J. H. Dunbar, George Smith, and others, for the purpose of erecting an electric light plant and constructing a system of waterworks.

GAINESVILLE, FLA.—A powerhouse for the electric plant is to be erected here.

SACRAMENTO, CAL.—The Yuba Electric Light, Power and Irrigation Company has been organized with the following directors: John Markley, of Geyserville; Walter Longbottom, Hiram W. Johnson, Frank D. Ryan and W. Bassett, of this city. Capital stock, $160,000.

MORTON, ILL.—Buyer Brothers & Company's electric light plant was demolished by explosion. Two persons were killed and many others injured.

PITTSBURGH, PA.—A new electric plant will be established at this city, to cost $100,000. The company will manufacture a new electric brake.

ROME, MICH.—An electric light plant, at a cost of $13,000, is to be established here.

LUDLOW, KY.—The people have started a movement for an electric light plant in that suburb and in West Covington. The same equipment can be made to serve both towns. Negotiations are under way with the Ludlow Lagoon Company for the use of the electric plant which lights the company's summer resort.

WARREN, PA.—Work on the improvements at the electric light plant has been commenced.

LOUISIANA, MO.—C. D. Shrieve, of Iowa, has a five years' lease of the carbon light plant at this place, and assumed possession.

ABILENE, TEX.—The Abilene electric light plant will soon be moved to the waterworks plant, a contract having been made by which Lytle Waterworks Company will furnish power for the light company.

HARLEM, ILL.—The Harlem Electric Light and Power Company has been incorporated; capital stock, $10,000; incorporators, Hermann Riffel, Henry Hilgenberg, John Freese.

New Electric Railways.

LITTLE FALLS, N. Y.—The Little Falls & Herkimer Street Railroad Company has been granted a franchise by the Common Council.

CORNING, N. Y.—There is a movement on foot to build an electric road to Elmira from this city. The promoters, who are eastern capitalists, the same ones interested in the Corning & Painted Post line, are said to be already getting figures on the scheme.

WILMINGTON, DEL.—The electric road from Shellpot Park to Gordon Heights will be reopened for travel in a few days. It is the intention of making it a pleasure ride, and round-trip tickets from Shellpot Park to the river will be sold for five cents.

LEWISTON, ME.—Another new railway project seems to be in order for Washington County, which is to be an electric road from Lubec to Machias, running through the towns of Trescott, Whiting and East Machias, a distance of 28 miles. This electric road will have a mail, express and freight service, as well as carry passengers.

PENSACOLA, FLA.—A new electric street railway will probably be erected here.

LANGHORNE, PA.—A contract for the construction of the trolley road from this place to Newtown has just been awarded to George W. Brubaker, of Philadelphia. It is expected that work will be begun at once, in order to have the road completed before winter. This will give a continuous trolley line from Newtown to Philadelphia, by way of Bristol, except for the short break at Croyden station.

JACKSON, MISS.—The first work on Jackson's electric railway has been begun. A survey will be made, after which the road will be pushed to completion.

ROCKFORD, WIS.—The survey of the electric line between this place, Beloit and Janesville is now in progress. There is considerable complaint against the building of the road, especially by the business men of Beloit.

DETROIT, MICH.—The City Electric Railway has presented an ordinance to the council providing for a double track along Pine Grove avenue and a track on Railroad street to connect their tunnel loop.

WILKINSBURG, PA.—An electric line from this place to Verona, by way of Frankstown road, has been proposed, and may be built within a year.

EL PASO, TEX.—Parties in Chicago having interests in this city have organized a company to build electric street car lines connecting El Paso and Juarez and El Paso to Fort Bliss.

LIMA, OHIO—The City Council has granted the Lima Street Railway Company additional franchises over several additional streets, and the lines will be extended several miles at once.

BIRMINGHAM ALA.—The Birmingham, Powderly & Bessemer Dummy Line has been granted a franchise on Second avenue from Eleventh to Seventeenth street, thence to Nineteenth street by way of Third avenue.

PHILADELPHIA, PA.—The Lehigh Traction Company engineers have surveyed a line from Jeddo to Eckley. It is the intention of the company to extend the trolley to Upper Lehigh, and construction work will be begun in a short time.

GLOVERSVILLE, N. Y.—The contract to grade the Mountain Lake Electric Road has been let to Alfred Keith. He will commence work at once, beginning at the north end of line, and is to finish the grading by December 6, 1897.

MEXIA, TEX.—Col. J. H. Vickers and Judge D. M. Prendergast and others are actively at work towards organizing an electric street car line connecting this city with Tehuacana.

New Incorporations.

DENVER, COLO.—Bridal Veil Electric Company has been incorporated; $100,000; T. Walter Beam and David Swickheimer of Telluride, and Edmund F. Richardson of Denver, San Miguel and Ouray counties, incorporators.

Kindred.... ...Interests

The Ward Leonard Electric Company, makers of rheostatic devices, are about to move their factory from Hoboken to Bronxville.

At the Maritime Exchange in New York a working model of a new electric motor, invented by Adam E. Schatz, for towing canal boats, has recently been exhibited.

The Lynn Incandescent Lamp Company, Lynn, Mass., are desirous of purchasing for cash 2,000,000 burned-out incandescent lamps for redemption by the "Lynn" renewal process.

The capital stock of the Proctor-Raymond Company, manufacturers of electrical specialties, has recently been increased, and the company are planning to push their products with renewed energy.

The Warren Electric and Specialty Company, Warren, Ohio, are sending out a little booklet, "Flim-Flam Tests versus the Test of Experience," apropos of the condition of the incandescent lamp market at the present time.

A very attractive little brochure, "The Construction of the Incandescent Lamp," has recently been published by Machado & Roller, New York representative of Elektricitats Gesellschaft, Berlin, showing the large factories of this company in Germany.

The Phœnix Carbon Manufacturing Company, St. Louis, are prepared to make carbon specialties of all kinds at any time. What they do not carry in stock they will make to order. Their motto "We'll find a way or make it," is especially apropos.

The Jeanesville Iron Works Company, of Jeanesville, Pa., have issued a very handsome catalogue, containing illustrations and descriptions of their pumping machinery for mines and for special work. The catalogue may be obtained free on request.

A new catalogue devoted to electric bell supplies has just been issued by Stanley & Patterson, of New York. This, with the recently published catalogue of electric light supplies, will be sent free on application to those interested, if the business card of the applicant is inclosed.

The Interior Conduit and Insulation Company have had a most successful season with the Lundell fan motors. The output of these motors from their factories has been greater than ever before, and, in view of the greatly increased foreign ordering for this apparatus, the company have been barely able to keep even with the demand.

The Berlin Iron Bridge Company, of East Berlin, Ct., have the contract for the new boiler house which the New York Belting and Packing Company is putting up at Passaic, N. J. The building will be entirely fireproof, brick walls, with steel roof trusses covered with the Berlin Iron Bridge Company's patent anti-condensation corrugated iron covering.

The Beacon Lamp Company, New Brunswick, N. J., announce that they are making a complete line of incandescent lamps, including standard lamps, 8 to 500 candle-power; series lamps, for arc circuit, 16 to 75 candle-power; candelabra lamps, 6 to 8 candle-power; miniature lamps, 1 to 8 candle-power; battery, surgical and dental lamps, candle, bunghole, spherical and sign lamps.

The Jandus Electric Company, Cleveland, Ohio, announce that the standard "Jandus" 150-hour arc lamp is the same as that formerly sold as the "Manhattan"; also that the Jandus Electric Company are sole owners of the patents of William Jandus, and the sole manufacturers of the 150-hour inclosed lamps made under these patents and heretofore sold as the "Manhattan." The Chicago office of this company is in the Monadnock Block, in charge of Mr. J. H. Cooke.

THE LEHIGH VALLEY
CREOSOTING CO.
WORKS, PERTH AMBOY, N. J.
Office, Room 1206 Bowling Green Offices, 11 Broadway, N. Y.
Creosoted Lumber, Underground Conduits, Telegraph Poles, Piling and Ties Furnished.

The Mayor and Gas Committee will receive bids to light the City of Waco, on an all-night and also on a moonlight schedule, with 125 to 200 arc lights, 2,000 c.-p., for a term of two to five years. We will also receive bids to install an electric light plant, specifications for which will be furnished by City Engineer on demand. All bids must be accompanied by a $1,000 certified check. We reserve the right to reject any or all bids. The bids will be opened by the Mayor and Gas Committee at 8 P. M., October 7th, 1897.

C. C. McCULLOCH,
Mayor, Waco, Texas.

ATTEST:
R. W. JOBLONOWSKI,
City Secretary.

A NEW THROUGH PASSENGER ROUTE
FOR COLORADO, UTAH AND CALIFORNIA.

The Chicago *Times-Herald* of August 27 says that on September 12 the new traffic alliance between the Chicago, Milwaukee & St. Paul Railway and the Chicago, Rock Island & Pacific Railway goes into effect, and on that date the former will send its first Denver sleeper out of Chicago. This will be attached to its regular night train for Omaha, and will be delivered there to the Rock Island. On October 2 the tourist car route over these two lines, the Colorado Midland and Southern Pacific, will be inaugurated. Tourist cars will be run once a week between Chicago and San Francisco. For further details regarding this new route call on or address Geo. H. Heafford, general passenger and ticket agent, C., M. & St. P. Ry., 410 Old Colony Building, Chicago, Ill.

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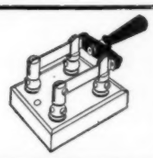
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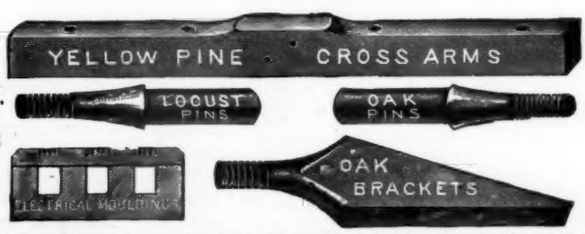

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED SEPTEMBER 14, 1897.

589,830 Secondary battery; H. W. Headland, London, Eng.—In an electrode for storage batteries, a metallic grid-like support for the active material consisting essentially of a series of superposed open frames of polygonal form interconnected at their exterior and interior angles by connecting rods or posts.

589,832 Electrical signaling device for use on pneumatic conveyer tubes; G. W. Hook, London, Eng.—In a signaling device for pneumatic conveyer tubes, the combination with a trigger arm provided with a convex side extending into the conveyer tube and pivoted within an air-tight chamber outside the conveyer tube, and a cam on the axis of said trigger arm; of a contact device adapted to be operated by said cam as said trigger arm swings on its pivot.

589,839 Armature for electric generators and motors; B. G Lamme, Pittsburgh, Pa.—An armature for electrical machines comprising a core provided with slots and a winding located in such slots, said winding comprising an inner long bar and outer short bar in each slot, and end connectors bolted or riveted to the projecting ends of the bars.

589,842 Method of manufacturing electrodes for secondary batteries; Henry Leitner, Niederschönhausen, Germany.

589,845 Coil for electrical machines; J. P. Mallett, Pittsburgh, Pa.—A coil for electrical machines comprising two parallel sides of unequal length and ends joining the same, said ends being bent both laterally and longitudinally at approximately their middle points, so that the corresponding faces of the adjacent portions lie in planes substantially perpendicular to each other.

589,865 Switch for electric circuits; H. B. Shallenberger, Rochester, Pa.—A switch for electric circuits comprising a suitable base provided with stationary terminals, a movable contact member having one end bent to form a bow spring and means for pivoting said spring end to one of the stationary terminals.

589,891 Elevator controller; M. W. Day, Schenectady, N. Y.—In an electric controller the combination of contacts for connecting the motor with the source of supply, means for disconnecting the motor from said source and connecting a resistance across the mains, and means for shunting the armature by a portion of the resistance.

589,893 Automatic switch for surface contact railways; E. W. Hewlett, Schenectady, N. Y.—In a surface contact railway system, a car provided with a storage battery, means for turning the car, and an automatic switch for reversing the battery connections.

589,894 Surface contact railway; E. W. Hewlett, Schenectady, N. Y.

589,897 Bell; S. Jevons and W. Collins, Birmingham, Eng.

589,904 Dynamo brush-holder; J. A. Marsh, St. Louis, Mo.—An improved dynamo brush-holder having a casting provided with a slot adapted to be fitted over a quadrant bar of a machine, a casting movably secured to the casting held to the quadrant bar, a bar adjustably secured to said movable casting, a clamp placed upon the end of said bar, said clamp carrying a brush, said movable casting regulated by a spring, said spring connec ing both castings.

589,938 Electrical cigar-lighter; T. C. Dobbins, Telluride, Colo.—The combination of a block having rows of insulated metallic pegs therein, the pegs in the alternate rows being electrically connected and adapted to be oppositely polarized, with a separate metallic igniting device constructed to be drawn across the surface of said pegs to create a series of short circuits, and thereby cause an ignition of the material on the igniting device.

589,996 Electric arc lamp; T. E. Adams, Cleveland, Ohio—The combination with a magnet, of an armature made in separate sections and a yieldable thermostatic strip secured to and connecting said sections.

590,000 Mounting for commutators of dynamo-electric machines; E. Caemmerer, Chicago, Ill.—The combination in a dynamo-electric machine with the commutator, of the commutator frame supporting said commutator, but electrically insulated therefrom, and an insulating mounting interposed between the commutator frame and the supporting part of the dynamo-electric machine.

590,046 Dynamometer; E. H. McHenry, St. Paul, Minn.

590,050 Electro-medical exercising apparatus; W. A. Webb, Brooklyn, N. Y.—An electro-medical apparatus, the combination with a suitable battery, of an exercising device comprising a cylindrical handle in partial circuit with the battery to be in closed circuit therewith when grasped, and detachably carrying a weighted body.

590,082 Trolley and conductor for electric railways.

590,098 Alternating current generator; H. Fairbanks, St. Johnsbury, Vt.—A continuously magnetized field magnet, having its poles facing each other, each pole divided into two or more equal pole divisions, alternately right and left-hand wound with generating coils, separate inductor masses reaching nearly across between the poles, and each substantially of the size of the presenting end of one of the said pole divisions, and a non-magnetic carrier arranged in one position to present the said inductors fairly to all the right hand-wound pole divisions, directing the magnetic flux through them, and in the next position to present these inductors to all the left hand-wound divisions, directing this flux through them in the same way, whereby an alternating current is induced in the said generating coils.

590,120 Conductor; James Swinburne, London, Eng.—An electric conductor made of electrically deposited zinc, compressed to increase its density and tenacity.

590,121 Electric trap; G. B. Vaughn, Kirkwood, Mo.—An electric trap consisting of a platform which is a conductor of electricity, a casing of non-electric conducting material, a bait receptacle which is a conductor of electricity located in the said casing, and an electric circuit which includes a generator, connected with the platform and bait receptacle.

590,136, 590,185 Telephone exchange system; W. W. Dean, St. Louis, Mo.

590,137, 590,186 Telephone system; W. W. Dean, St. Louis, Mo.

590,151 Secondary battery; G. Hart, Detroit, Mich.—An electrode for a secondary or storage battery, consisting of two similar sheets of metallic lead, each sheet having half cells formed by walls integral with the said sheet, the side walls converging toward the latter from the open top of the trough to the bottom, the two plates being united with the half cells registering adjacent series of said cells being separated by plane vertical portions of the united sheets, which are united when the two sheets are brought together.

590,171 Electric bath; J. J. Stanger, Stuttgart, Germany.

Engineering School of Union College.

The Engineering School of Union College at Schenectady, N. Y., has issued a special circular describing the final establishment of a course in electrical engineering. This course, which was first offered to students in the fall of 1895, is now fully arranged and valuable facilities have been secured for it. Arrangements have been made between the college authorities and the officials of the General Electric Company, whose works are at Schenectady, by which students in the junior and senior classes are admitted to the company's plant at regular schedule times under the protection of their instructor, with the privilege and opportunity of studying and inspecting the plant. This work has been systematically arranged. Catalogues and other information regarding this course can be obtained from Prof. Olin H. Landreth, Union College, Schenectady, N. Y.

A compromise has been effected between the Postal Telegraph company and the Portland & Yarmouth, Me., Electric Railroad in reference to the location of the trolley wires in Yarmouth. The case has been taken out of the United States court.

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